

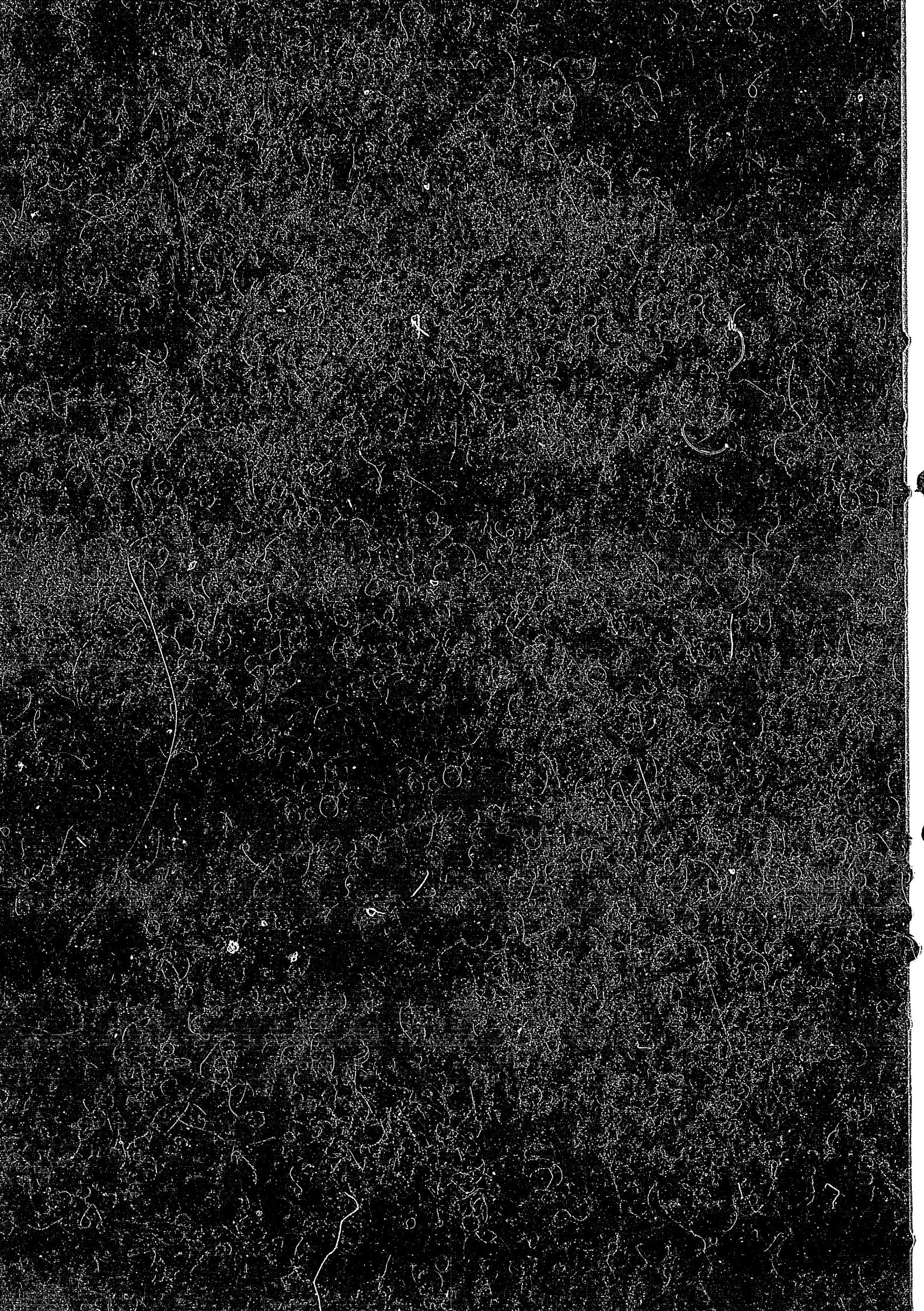
IPPJ-AM-22

ELECTRON CAPTURE AND LOSS CROSS SECTIONS FOR COLLISIONS
BETWEEN HEAVY IONS AND HYDROGEN MOLECULES
(UPDATED VERSION OF PRJAM-20)

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BETWEEN HEAVY IONS AND HYDROGEN MOLECULES

(Up-dated version of IPPJ-AM-20 by Y. Kaneko, Y. Itikawa, T. Iwai, T. Kato
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June 1983

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Abstract

Up-dated are experimental data on the cross sections for electron-capture and -loss collisions between heavy ions ($Z \geq Li$) and hydrogen molecules. The result is shown in graphs as a function of the incident energy of the ions.

Introduction

This is the first up-dated version to our previous compilation of data on the electron capture and loss cross sections involving heavy ions entitled
“Electron capture and loss cross sections for collisions between heavy ions and hydrogen molecules”

by Y. Kaneko, Y. Itikawa, T. Iwai, T. Kato, Y. Nakai, K. Okuno and H. Tawara (IPPJ-AM-20, 1981).

New data surveyed through the early 1983 as well as those compiled previously are shown in the following figures in the unit of eV/amu for the incident energy and of cm²/molecule for the cross section. New data are indicated with square marks in figures. The processes of available data are listed in Section I and the references are shown in Section II.

Acknowledgements

The authors would like to express their thanks to the member of the Study Group for Atomic Processes in Fusion Plasma for their valuable discussion and comments.

I. LIST OF PROCESSES SHOWN IN FIGURES

(1) Charge Transfer

Fig. No.	Processes				References
1.	Li^+	+	H_2	\rightarrow	Li
2.	Li^{2+}	+	H_2	\rightarrow	Li^+
3.	Li^{3+}	+	H_2	\rightarrow	Li^{2+}
4.	Be^{2+}	+	H_2	\rightarrow	Be^+
5.	Be^{3+}	+	H_2	\rightarrow	Be^{2+}
6.	Be^{4+}	+	H_2	\rightarrow	Be^{3+}
7.	B^+	+	H_2	\rightarrow	B
8.	B^{2+}	+	H_2	\rightarrow	B^+
9.	B^{3+}	+	H_2	\rightarrow	B^+
10.	B^{3+}	+	H_2	\rightarrow	B^{2+}
11.	B^{4+}	+	H_2	\rightarrow	B^{2+}
12.	B^{4+}	+	H_2	\rightarrow	B^{3+}
13.	B^{5+}	+	H_2	\rightarrow	B^{4+}
14.	C^+	+	H_2	\rightarrow	C
15.	C^{2+}	+	H_2	\rightarrow	C^+
16.	C^{3+}	+	H_2	\rightarrow	C^{2+}
17.	C^{4+}	+	H_2	\rightarrow	C^{2+}
18.	C^{4+}	+	H_2	\rightarrow	C^{3+}
19.	C^{5+}	+	H_2	\rightarrow	C^{4+}
20.	C^{6+}	+	H_2	\rightarrow	C^{5+}
21.	N^+	+	H_2	\rightarrow	N
22.	N^{2+}	+	H_2	\rightarrow	N^+
23.	N^{3+}	+	H_2	\rightarrow	N^{2+}
24.	N^{4+}	+	H_2	\rightarrow	N^{3+}
25.	N^{5+}	+	H_2	\rightarrow	N^{4+}
26.	N^{5+}	+	H_2	\rightarrow	N^{4+}

Fig. No.	Processes				References
27.	N^{6+}	+	H_2	\rightarrow	N^{5+}
28.	N^{7+}	+	H_2	\rightarrow	N^{6+}
29.	O^+	+	H_2	\rightarrow	O
30.	O^{2+}	+	H_2	\rightarrow	O
31.	O^{2+}	+	H_2	\rightarrow	O^+
32.	O^{3+}	+	H_2	\rightarrow	O^{2+}
33.	O^{4+}	+	H_2	\rightarrow	O^{3+}
34.	O^{5+}	+	H_2	\rightarrow	O^{3+}
35.	O^{5+}	+	H_2	\rightarrow	O^{4+}
36.	O^{6+}	+	H_2	\rightarrow	O^{4+}
37.	O^{6+}	+	H_2	\rightarrow	O^{5+}
38.	O^{7+}	+	H_2	\rightarrow	O^{6+}
39.	O^{8+}	+	H_2	\rightarrow	O^{7+}
40.	F^+	+	H_2	\rightarrow	F
41.	F^{9+}	+	H_2	\rightarrow	F^{8+}
42.	Ne^+	+	H_2	\rightarrow	Ne
43.	Ne^{2+}	+	H_2	\rightarrow	Ne^+
44.	Ne^{3+}	+	H_2	\rightarrow	Ne^{2+}
45.	Ne^{4+}	+	H_2	\rightarrow	Ne^{3+}
46.	Ne^{6+}	+	H_2	\rightarrow	Ne^{5+}
47.	Ne^{8+}	+	H_2	\rightarrow	Ne^{7+}
48.	Ne^{9+}	+	H_2	\rightarrow	Ne^{8+}
49.	Ne^{10+}	+	H_2	\rightarrow	Ne^{9+}
50.	Na^{2+}	+	H_2	\rightarrow	Na^+
51.	Na^{3+}	+	H_2	\rightarrow	Na^{2+}
52.	Na^{4+}	+	H_2	\rightarrow	Na^{3+}
53.	Mg^{2+}	+	H_2	\rightarrow	Mg^+
54.	Mg^{3+}	+	H_2	\rightarrow	Mg^{2+}

Fig. No.	Processes				References
55.	Mg^{3+}	+	H_2	\rightarrow	Mg^+
56.	Mg^{4+}	+	H_2	\rightarrow	Mg^{3+}
57.	Mg^{4+}	+	H_2	\rightarrow	Mg^{2+}
58.	Mg^{5+}	+	H_2	\rightarrow	Mg^{4+}
59.	Mg^{5+}	+	H_2	\rightarrow	Mg^{3+}
60.	Al^{2+}	+	H_2	\rightarrow	Al^+
61.	Al^{3+}	+	H_2	\rightarrow	Al^{2+}
62.	Al^{3+}	+	H_2	\rightarrow	Al^+
63.	Al^{4+}	+	H_2	\rightarrow	Al^{3+}
64.	Al^{4+}	+	H_2	\rightarrow	Al^{2+}
65.	Al^{5+}	+	H_2	\rightarrow	Al^{4+}
66.	Si^{2+}	+	H_2	\rightarrow	Si^+
67.	Si^{3+}	+	H_2	\rightarrow	Si^{2+}
68.	Si^{4+}	+	H_2	\rightarrow	Si^{3+}
69.	Si^{5+}	+	H_2	\rightarrow	Si^{4+}
70.	Si^{6+}	+	H_2	\rightarrow	Si^{5+}
71.	Si^{7+}	+	H_2	\rightarrow	Si^{6+}
72.	Si^{8+}	+	H_2	\rightarrow	Si^{7+}
73.	Si^{9+}	+	H_2	\rightarrow	Si^{8+}
74.	Si^{11+}	+	H_2	\rightarrow	Si^{10+}
75.	Cl^{3+}	+	H_2	\rightarrow	Cl^{2+}
76.	Cl^{4+}	+	H_2	\rightarrow	Cl^{3+}
77.	K^+	+	H_2	\rightarrow	K
78.	Ar^+	+	H_2	\rightarrow	1, 2, 5
79.	Ar^{2+}	+	H_2	\rightarrow	31, 32, 51, 58
80.	Ar^{3+}	+	H_2	\rightarrow	32, 58
81.	Ar^{3+}	+	H_2	\rightarrow	31, 32, 51, 58, 59
82.	Ar^{4+}	+	H_2	\rightarrow	32, 58

Fig. No.	Processes				References
83.	Ar^{4+}	+	H_2	\rightarrow	Ar^{3+}
84.	Ar^{5+}	+	H_2	\rightarrow	Ar^{4+}
85.	Ar^{6+}	+	H_2	\rightarrow	Ar^{4+}
86.	Ar^{6+}	+	H_2	\rightarrow	Ar^{5+}
87.	Ar^{7+}	+	H_2	\rightarrow	Ar^{6+}
88.	Ar^{8+}	+	H_2	\rightarrow	Ar^{7+}
89.	Ar^{9+}	+	H_2	\rightarrow	Ar^{8+}
90.	Ar^{10+}	+	H_2	\rightarrow	Ar^{9+}
91.	Ar^{18+}	+	H_2	\rightarrow	Ar^{17+}
92.	Ti^{2+}	+	H_2	\rightarrow	Ti
93.	Ti^{2+}	+	H_2	\rightarrow	Ti^+
94.	Fe^{3+}	+	H_2	\rightarrow	Fe^+
95.	Fe^{3+}	+	H_2	\rightarrow	Fe^{2+}
96.	Fe^{4+}	+	H_2	\rightarrow	Fe^{3+}
97.	Fe^{5+}	+	H_2	\rightarrow	Fe^{4+}
98.	Fe^{6+}	+	H_2	\rightarrow	Fe^{5+}
99.	Fe^{7+}	+	H_2	\rightarrow	Fe^{6+}
100.	Fe^{8+}	+	H_2	\rightarrow	Fe^{7+}
101.	Fe^{9+}	+	H_2	\rightarrow	Fe^{8+}
102.	Fe^{10+}	+	H_2	\rightarrow	Fe^{9+}
103.	Fe^{11+}	+	H_2	\rightarrow	Fe^{10+}
104.	Fe^{12+}	+	H_2	\rightarrow	Fe^{10+}
105.	Fe^{12+}	+	H_2	\rightarrow	Fe^{11+}
106.	Fe^{13+}	+	H_2	\rightarrow	Fe^{12+}
107.	Fe^{14+}	+	H_2	\rightarrow	Fe^{12+}
108.	Fe^{14+}	+	H_2	\rightarrow	Fe^{13+}
109.	Fe^{15+}	+	H_2	\rightarrow	Fe^{14+}
110.	Fe^{16+}	+	H_2	\rightarrow	Fe^{14+}

Fig. No.	Processes				References
111.	Fe^{16+}	+	H_2	\rightarrow	Fe^{15+}
112.	Fe^{18+}	+	H_2	\rightarrow	Fe^{16+}
113.	Fe^{18+}	+	H_2	\rightarrow	Fe^{17+}
114.	Fe^{20+}	+	H_2	\rightarrow	Fe^{18+}
115.	Fe^{20+}	+	H_2	\rightarrow	Fe^{19+}
116.	Fe^{21+}	+	H_2	\rightarrow	Fe^{19+}
117.	Fe^{21+}	+	H_2	\rightarrow	Fe^{20+}
118.	Fe^{22+}	+	H_2	\rightarrow	Fe^{20+}
119.	Fe^{22+}	+	H_2	\rightarrow	Fe^{21+}
120.	Fe^{23+}	+	H_2	\rightarrow	Fe^{22+}
121.	Fe^{24+}	+	H_2	\rightarrow	Fe^{23+}
122.	Fe^{25+}	+	H_2	\rightarrow	Fe^{24+}
123.	$\text{Zn}^{?+}$	+	H_2	\rightarrow	Zn^+
124.	Br^{3+}	+	H_2	\rightarrow	Br^{2+}
125.	Br^{4+}	+	H_2	\rightarrow	Br^{3+}
126.	Br^{5+}	+	H_2	\rightarrow	Br^{4+}
127.	Br^{6+}	+	H_2	\rightarrow	Br^{4+}
128.	Br^{6+}	+	H_2	\rightarrow	Br^{5+}
129.	Br^{7+}	+	H_2	\rightarrow	Br^{5+}
130.	Br^{7+}	+	H_2	\rightarrow	Br^{6+}
131.	Br^{8+}	+	H_2	\rightarrow	Br^{6+}
132.	Br^{8+}	+	H_2	\rightarrow	Br^{7+}
133.	Br^{9+}	+	H_2	\rightarrow	Br^{8+}
134.	Br^{10+}	+	H_2	\rightarrow	Br^{9+}
135.	Br^{11+}	+	H_2	\rightarrow	Br^{10+}
136.	Br^{12+}	+	H_2	\rightarrow	Br^{11+}
137.	Kr^{2+}	+	H_2	\rightarrow	Kr^+
138.	Kr^{3+}	+	H_2	\rightarrow	Kr^+

Fig. No.	Processes				References
139.	Kr^{3+}	+	H_2	\rightarrow	Kr^{2+}
140.	Kr^{4+}	+	H_2	\rightarrow	Kr^{2+}
141.	Kr^{4+}	+	H_2	\rightarrow	Kr^{3+}
142.	Kr^{5+}	+	H_2	\rightarrow	Kr^{3+}
143.	Kr^{5+}	+	H_2	\rightarrow	Kr^{4+}
144.	Kr^{6+}	+	H_2	\rightarrow	Kr^{4+}
145.	Kr^{6+}	+	H_2	\rightarrow	Kr^{5+}
146.	Kr^{7+}	+	H_2	\rightarrow	Kr^{5+}
147.	Kr^{7+}	+	H_2	\rightarrow	Kr^{6+}
148.	Kr^{8+}	+	H_2	\rightarrow	Kr^{7+}
149.	Mo^{4+}	+	H_2	\rightarrow	Mo^{3+}
150.	Mo^{5+}	+	H_2	\rightarrow	Mo^{4+}
151.	Mo^{6+}	+	H_2	\rightarrow	Mo^{5+}
152.	Mo^{7+}	+	H_2	\rightarrow	Mo^{6+}
153.	Mo^{8+}	+	H_2	\rightarrow	Mo^{7+}
154.	Mo^{9+}	+	H_2	\rightarrow	Mo^{8+}
155.	Mo^{10+}	+	H_2	\rightarrow	Mo^{9+}
156.	Mo^{11+}	+	H_2	\rightarrow	Mo^{10+}
157.	Mo^{12+}	+	H_2	\rightarrow	Mo^{11+}
158.	Mo^{13+}	+	H_2	\rightarrow	Mo^{12+}
159.	Mo^{14+}	+	H_2	\rightarrow	Mo^{13+}
160.	Mo^{15+}	+	H_2	\rightarrow	Mo^{14+}
161.	Mo^{16+}	+	H_2	\rightarrow	Mo^{15+}
162.	Mo^{17+}	+	H_2	\rightarrow	Mo^{16+}
163.	Mo^{18+}	+	H_2	\rightarrow	Mo^{17+}
164.	Cd^{2+}	+	H_2	\rightarrow	Cd^+
165.	I^{2+}	+	H_2	\rightarrow	I^-
166.	I^{2+}	+	H_2	\rightarrow	I^+

Fig. No.	Processes				References
167.	I^{3+}	+	H_2	\rightarrow	I^+
168.	I^{3+}	+	H_2	\rightarrow	I^{2+}
169.	I^{4+}	+	H_2	\rightarrow	I^{2+}
170.	I^{4+}	+	H_2	\rightarrow	I^{3+}
171.	I^{5+}	+	H_2	\rightarrow	I^{5+}
172.	I^{5+}	+	H_2	\rightarrow	I^{4+}
173.	I^{6+}	+	H_2	\rightarrow	I^{4+}
174.	I^{6+}	+	H_2	\rightarrow	I^{5+}
175.	I^{7+}	+	H_2	\rightarrow	I^{5+}
176.	I^{7+}	+	H_2	\rightarrow	I^{6+}
177.	I^{8+}	+	H_2	\rightarrow	I^{6+}
178.	I^{8+}	+	H_2	\rightarrow	I^{7+}
179.	I^{9+}	+	H_2	\rightarrow	I^{7+}
180.	I^{9+}	+	H_2	\rightarrow	I^{8+}
181.	I^{10+}	+	H_2	\rightarrow	I^{8+}
182.	I^{10+}	+	H_2	\rightarrow	I^{9+}
183.	I^{11+}	+	H_2	\rightarrow	I^{10+}
184.	I^{12+}	+	H_2	\rightarrow	I^{11+}
185.	I^{13+}	+	H_2	\rightarrow	I^{12+}
186.	I^{14+}	+	H_2	\rightarrow	I^{13+}
187.	I^{15+}	+	H_2	\rightarrow	I^{14+}
188.	I^{16+}	+	H_2	\rightarrow	I^{15+}
189.	I^{17+}	+	H_2	\rightarrow	I^{16+}
190.	I^{18+}	+	H_2	\rightarrow	I^{17+}
191.	Xe^{2+}	+	H_2	\rightarrow	Xe^+
192.	Xe^{3+}	+	H_2	\rightarrow	Xe^{2+}
193.	Xe^{4+}	+	H_2	\rightarrow	Xe^{3+}
194.	Xe^{5+}	+	H_2	\rightarrow	Xe^{4+}

Fig. No.	Processes				References	
195.	Xe ⁶⁺	+	H ₂	→	Xe ⁵⁺	31
196.	Xe ⁷⁺	+	H ₂	→	Xe ⁶⁺	31
197.	Xe ⁸⁺	+	H ₂	→	Xe ⁷⁺	31
198.	Xe ⁹⁺	+	H ₂	→	Xe ⁸⁺	31
199.	Xe ¹⁰⁺	+	H ₂	→	Xe ⁹⁺	31
200.	Xe ¹¹⁺	+	H ₂	→	Xe ¹⁰⁺	31
201.	Xe ¹²⁺	+	H ₂	→	Xe ¹¹⁺	31
202.	Cs ²⁺	+	H ₂	→	Cs ⁺	45
203.	Cs ³⁺	+	H ₂	→	Cs ⁺	45
204.	Cs ³⁺	+	H ₂	→	Cs ²⁺	45
205.	Cs ⁴⁺	+	H ₂	→	Cs ²⁺	45
206.	Cs ⁴⁺	+	H ₂	→	Cs ³⁺	45
207.	Cs ⁵⁺	+	H ₂	→	Cs ³⁺	45
208.	Cs ⁵⁺	+	H ₂	→	Cs ⁴⁺	45
209.	Ba ²⁺	+	H ₂	→	Ba ⁺	28
210.	Ta ³⁺	+	H ₂	→	Ta ²⁺	25
211.	Ta ⁴⁺	+	H ₂	→	Ta ³⁺	25
212.	Ta ⁵⁺	+	H ₂	→	Ta ⁴⁺	25
213.	Ta ⁶⁺	+	H ₂	→	Ta ⁵⁺	25
214.	Ta ⁷⁺	+	H ₂	→	Ta ⁶⁺	25
215.	Ta ⁸⁺	+	H ₂	→	Ta ⁷⁺	25
216.	Ta ⁹⁺	+	H ₂	→	Ta ⁸⁺	25
217.	Ta ¹⁰⁺	+	H ₂	→	Ta ⁹⁺	25
218.	Ta ¹¹⁺	+	H ₂	→	Ta ¹⁰⁺	25
219.	Ta ¹²⁺	+	H ₂	→	Ta ¹¹⁺	25
220.	Ta ¹³⁺	+	H ₂	→	Ta ¹²⁺	25
221.	Ta ¹⁴⁺	+	H ₂	→	Ta ¹³⁺	25
222.	Ta ¹⁵⁺	+	H ₂	→	Ta ¹⁴⁺	25

Fig. No.	Processes				References
223.	Ta^{16+}	+	H_2	\rightarrow	Ta^{15+}
224.	Ta^{17+}	+	H_2	\rightarrow	Ta^{16+}
225.	Ta^{18+}	+	H_2	\rightarrow	Ta^{17+}
226.	Ta^{19+}	+	H_2	\rightarrow	Ta^{18+}
227.	W^{4+}	+	H_2	\rightarrow	W^{3+}
228.	W^{5+}	+	H_2	\rightarrow	W^{4+}
229.	W^{6+}	+	H_2	\rightarrow	W^{5+}
230.	W^{7+}	+	H_2	\rightarrow	W^{6+}
231.	W^{8+}	+	H_2	\rightarrow	W^{7+}
232.	W^{9+}	+	H_2	\rightarrow	W^{8+}
233.	W^{10+}	+	H_2	\rightarrow	W^{9+}
234.	W^{11+}	+	H_2	\rightarrow	W^{10+}
235.	W^{12+}	+	H_2	\rightarrow	W^{11+}
236.	W^{13+}	+	H_2	\rightarrow	W^{12+}
237.	W^{14+}	+	H_2	\rightarrow	W^{13+}
238.	W^{15+}	+	H_2	\rightarrow	W^{14+}
239.	Au^{5+}	+	H_2	\rightarrow	Au^{4+}
240.	Au^{6+}	+	H_2	\rightarrow	Au^{5+}
241.	Au^{7+}	+	H_2	\rightarrow	Au^{6+}
242.	Au^{8+}	+	H_2	\rightarrow	Au^{7+}
243.	Au^{9+}	+	H_2	\rightarrow	Au^{8+}
244.	Au^{10+}	+	H_2	\rightarrow	Au^{9+}
245.	Au^{11+}	+	H_2	\rightarrow	Au^{10+}
246.	Au^{12+}	+	H_2	\rightarrow	Au^{11+}
247.	Au^{13+}	+	H_2	\rightarrow	Au^{12+}
248.	Au^{14+}	+	H_2	\rightarrow	Au^{13+}
249.	Au^{15+}	+	H_2	\rightarrow	Au^{14+}
250.	Au^{16+}	+	H_2	\rightarrow	Au^{15+}

Fig. No.	Processes				References
251.	Pb^{2+}	+	H_2	\rightarrow	Pb^+
252.	Pb^{3+}	+	H_2	\rightarrow	Pb^+
253.	Pb^{3+}	+	H_2	\rightarrow	Pb^{2+}
254.	Pb^{4+}	+	H_2	\rightarrow	Pb^{2+}
255.	Pb^{4+}	+	H_2	\rightarrow	Pb^{3+}
256.	Pb^{5+}	+	H_2	\rightarrow	Pb^{3+}
257.	Pb^{5+}	+	H_2	\rightarrow	Pb^{4+}
258.	Pb^{6+}	+	H_2	\rightarrow	Pb^{4+}
259.	Pb^{6+}	+	H_2	\rightarrow	Pb^{5+}
260.	Pb^{7+}	+	H_2	\rightarrow	Pb^{5+}
261.	Pb^{7+}	+	H_2	\rightarrow	Pb^{6+}
262.	Bi^{2+}	+	H_2	\rightarrow	Bi^+
263.	Bi^{3+}	+	H_2	\rightarrow	Bi^+
264.	Bi^{3+}	+	H_2	\rightarrow	Bi^{2+}
265.	Bi^{4+}	+	H_2	\rightarrow	Bi^{2+}
266.	Bi^{4+}	+	H_2	\rightarrow	Bi^{3+}
267.	Bi^{5+}	+	H_2	\rightarrow	Bi^{3+}
268.	Bi^{5+}	+	H_2	\rightarrow	Bi^{4+}
269.	Bi^{6+}	+	H_2	\rightarrow	Bi^{4+}
270.	Bi^{6+}	+	H_2	\rightarrow	Bi^{5+}
271.	Bi^{7+}	+	H_2	\rightarrow	Bi^{5+}
272.	Bi^{7+}	+	H_2	\rightarrow	Bi^{6+}

(2) Ionization

Fig. No.	Processes					References
A1.	Li^+	+	H_2	\rightarrow	Li^{2+}	10, 20
A2.	Li^{2+}	+	H_2	\rightarrow	Li^{3+}	10, 20
A3.	B^+	+	H_2	\rightarrow	B^{2+}	29
A4.	B^{2+}	+	H_2	\rightarrow	B^{3+}	29
A5.	C^+	+	H_2	\rightarrow	C^{2+}	29
A6.	C^{2+}	+	H_2	\rightarrow	C^{3+}	29
A7.	C^{3+}	+	H_2	\rightarrow	C^{4+}	29
A8.	C^{4+}	+	H_2	\rightarrow	C^{5+}	12
A9.	N^{4+}	+	H_2	\rightarrow	N^{5+}	12
A10.	O^{2+}	+	H_2	\rightarrow	O^{3+}	4
A11.	Si^{3+}	+	H_2	\rightarrow	Si^{4+}	22
A12.	Si^{4+}	+	H_2	\rightarrow	Si^{5+}	22
A13.	Cl^{2+}	+	H_2	\rightarrow	Cl^{3+}	7
A14.	Cl^{3+}	+	H_2	\rightarrow	Cl^{4+}	7
A15.	K^+	+	H_2	\rightarrow	K^{2+}	14
A16.	Fe^{3+}	+	H_2	\rightarrow	Fe^{4+}	40
A17.	Fe^{4+}	+	H_2	\rightarrow	Fe^{5+}	44
A18.	Fe^{4+}	+	H_2	\rightarrow	Fe^{6+}	44
A19.	Fe^{4+}	+	H_2	\rightarrow	Fe^{7+}	44
A20.	Fe^{9+}	+	H_2	\rightarrow	Fe^{10+}	40
A21.	Fe^{12+}	+	H_2	\rightarrow	Fe^{13+}	40
A22.	Fe^{14+}	+	H_2	\rightarrow	Fe^{15+}	40
A23.	Fe^{14+}	+	H_2	\rightarrow	Fe^{16+}	40
A24.	Fe^{16+}	+	H_2	\rightarrow	Fe^{17+}	40
A25.	Fe^{16+}	+	H_2	\rightarrow	Fe^{18+}	40
A26.	Fe^{18+}	+	H_2	\rightarrow	Fe^{19+}	40
A27.	Fe^{20+}	+	H_2	\rightarrow	Fe^{21+}	17, 40

Fig. No.	Processes				References
A28.	Fe^{21+}	+	H_2	\rightarrow	Fe^{22+}
A29.	Fe^{21+}	+	H_2	\rightarrow	Fe^{23+}
A30.	Fe^{22+}	+	H_2	\rightarrow	Fe^{23+}
A31.	Fe^{22+}	+	H_2	\rightarrow	Fe^{24+}
A32.	Fe^{23+}	+	H_2	\rightarrow	Fe^{24+}
A33.	Fe^{24+}	+	H_2	\rightarrow	Fe^{25+}
A34.	Fe^{25+}	+	H_2	\rightarrow	Fe^{26+}
A35.	Br^{3+}	+	H_2	\rightarrow	Br^{4+}
A36.	Br^{4+}	+	H_2	\rightarrow	Br^{5+}
A37.	Br^{4+}	+	H_2	\rightarrow	Br^{6+}
A38.	Br^{4+}	+	H_2	\rightarrow	Br^{7+}
A39.	Br^{4+}	+	H_2	\rightarrow	Br^{8+}
A40.	Br^{5+}	+	H_2	\rightarrow	Br^{6+}
A41.	Br^{5+}	+	H_2	\rightarrow	Br^{7+}
A42.	Br^{6+}	+	H_2	\rightarrow	Br^{7+}
A43.	Br^{6+}	+	H_2	\rightarrow	Br^{8+}
A44.	Br^{7+}	+	H_2	\rightarrow	Br^{8+}
A45.	Br^{7+}	+	H_2	\rightarrow	Br^{9+}
A46.	Br^{8+}	+	H_2	\rightarrow	Br^{9+}
A47.	Br^{8+}	+	H_2	\rightarrow	Br^{10+}
A48.	Br^{9+}	+	H_2	\rightarrow	Br^{10+}
A49.	Br^{10+}	+	H_2	\rightarrow	Br^{11+}
A50.	Br^{11+}	+	H_2	\rightarrow	Br^{12+}
A51.	I^{2+}	+	H_2	\rightarrow	I^{3+}
A52.	I^{2+}	+	H_2	\rightarrow	I^{4+}
A53.	I^{2+}	+	H_2	\rightarrow	I^{5+}
A54.	I^{3+}	+	H_2	\rightarrow	I^{4+}
A55.	I^{3+}	+	H_2	\rightarrow	I^{5+}

Fig. No.	Processes				References
A56.	I ³⁺	+	H ₂	→	I ⁶⁺
A57.	I ⁴⁺	+	H ₂	→	I ⁵⁺
A58.	I ⁴⁺	+	H ₂	→	I ⁶⁺
A59.	I ⁴⁺	+	H ₂	→	I ⁷⁺
A60.	I ⁵⁺	+	H ₂	→	I ⁶⁺
A61.	I ⁵⁺	+	H ₂	→	I ⁷⁺
A62.	I ⁵⁺	+	H ₂	→	I ⁸⁺
A63.	I ⁶⁺	+	H ₂	→	I ⁷⁺
A64.	I ⁶⁺	+	H ₂	→	I ⁸⁺
A65.	I ⁶⁺	+	H ₂	→	I ⁹⁺
A66.	I ⁷⁺	+	H ₂	→	I ⁸⁺
A67.	I ⁷⁺	+	H ₂	→	I ⁹⁺
A68.	I ⁸⁺	+	H ₂	→	I ⁹⁺
A69.	I ⁸⁺	+	H ₂	→	I ¹⁰⁺
A70.	I ⁹⁺	+	H ₂	→	I ¹⁰⁺
A71.	I ⁹⁺	+	H ₂	→	I ¹¹⁺
A72.	I ¹⁰⁺	+	H ₂	→	I ¹¹⁺

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III. FIGURES

— CROSS SECTIONS FOR $H_2 + X^{q+} \rightarrow H_2 + X^{(q-n)+}$ —

Fig. 1 $\text{Li}^+ + \text{H}_2 \rightarrow \text{Li}$

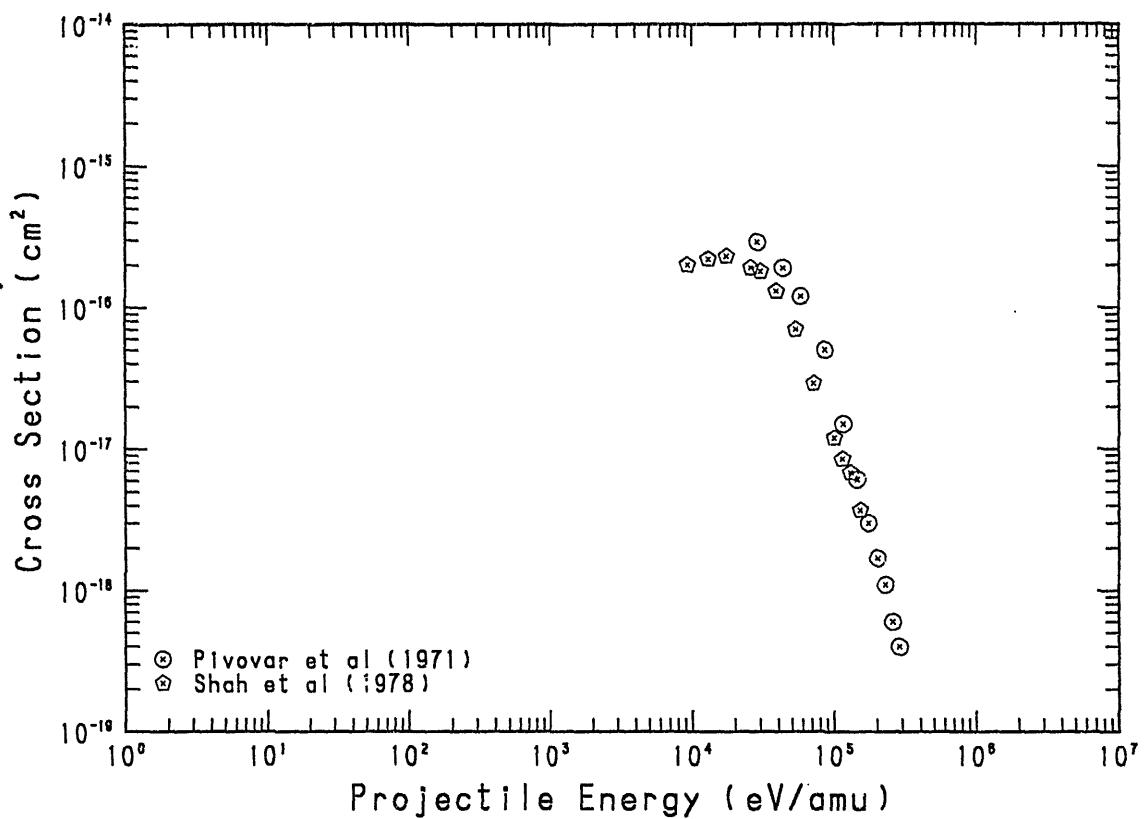


Fig. 2 $\text{Li}^{+2} + \text{H}_2 \rightarrow \text{Li}^+$

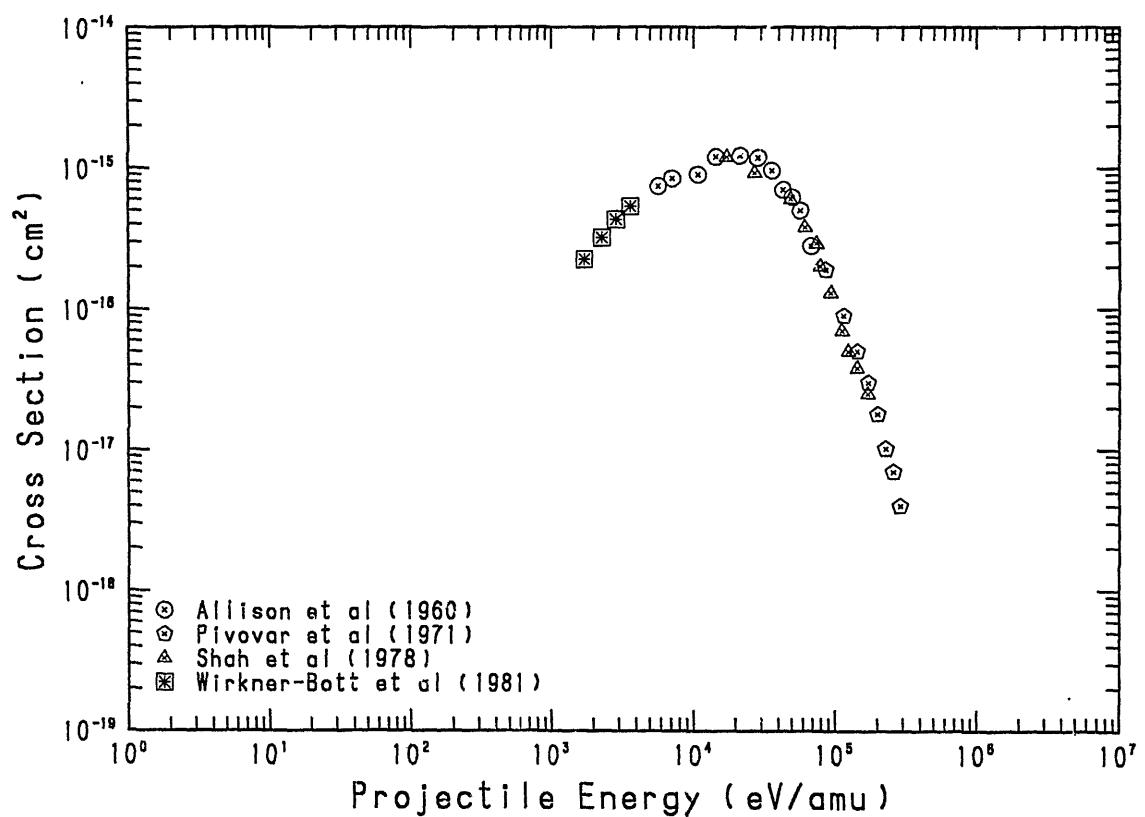


Fig.3 $\text{Li}^{3+} + \text{H}_2 \rightarrow \text{Li}^{2+}$

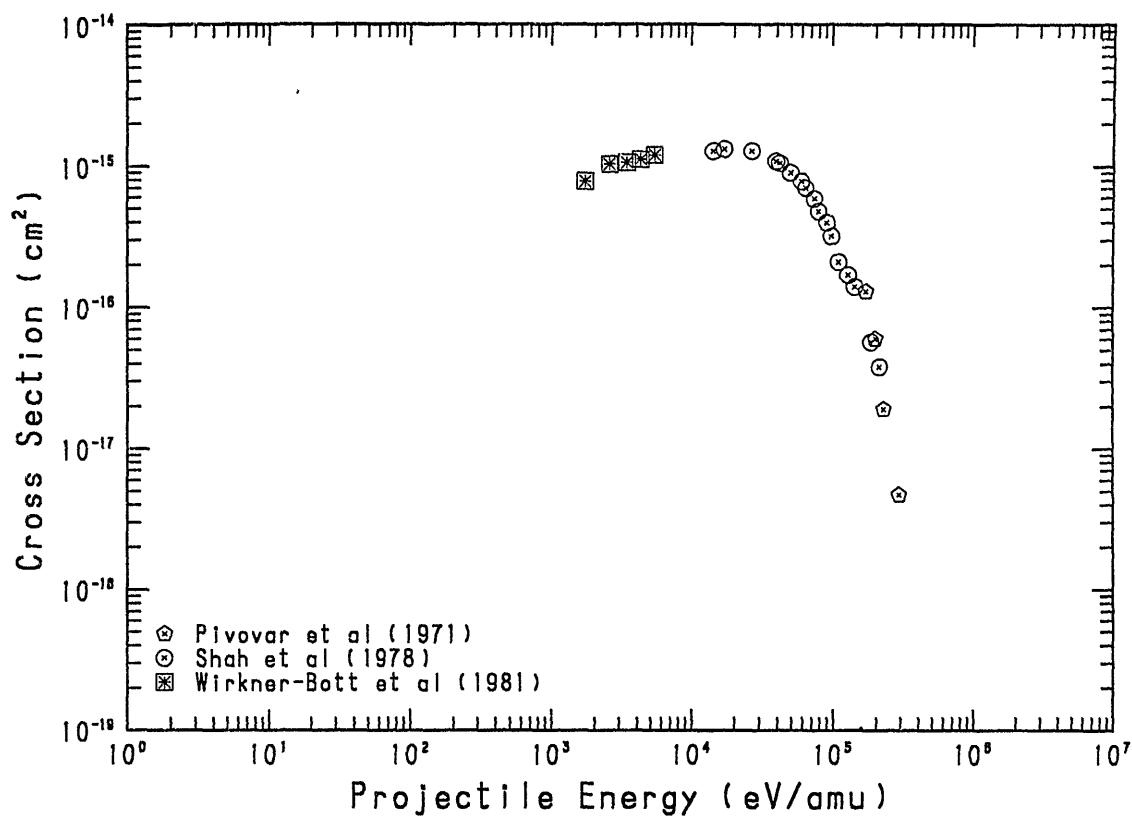


Fig.4 $\text{Be}^{2+} + \text{H}_2 \rightarrow \text{Be}^+$

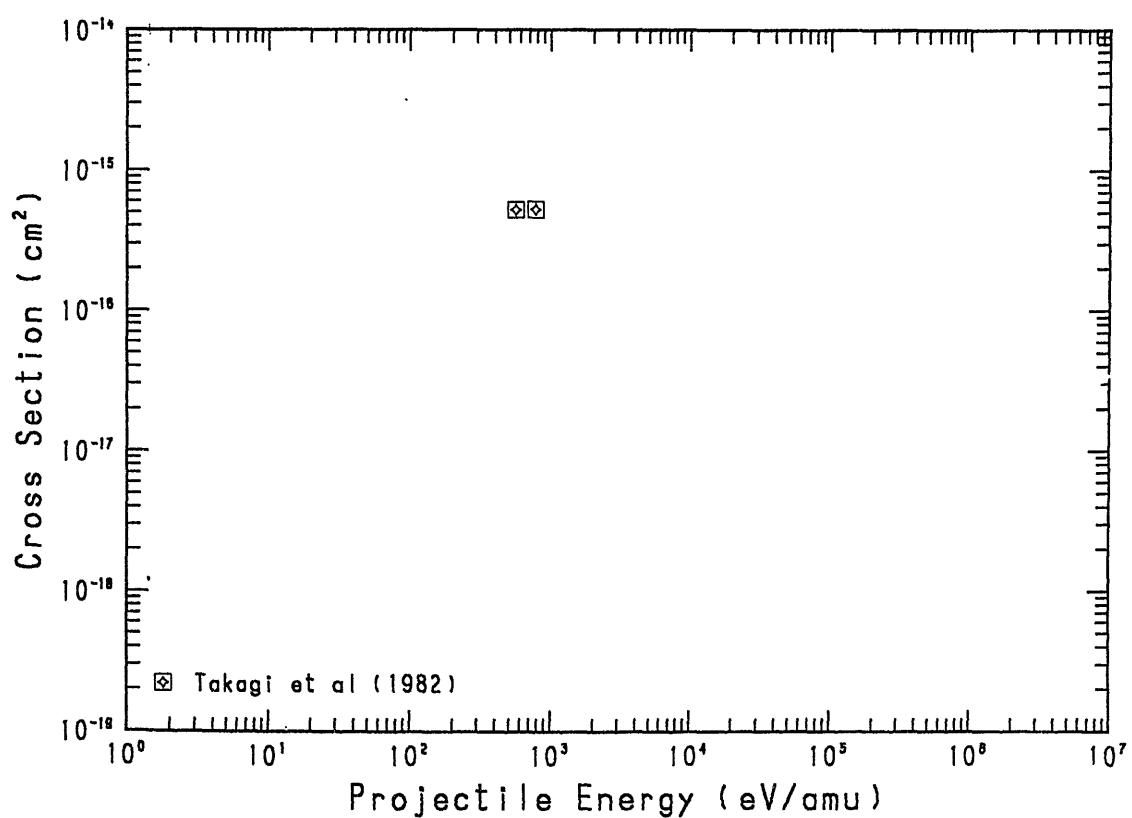


Fig. 5 $\text{Be}^{3+} + \text{H}_2 \rightarrow \text{Be}^{2+}$

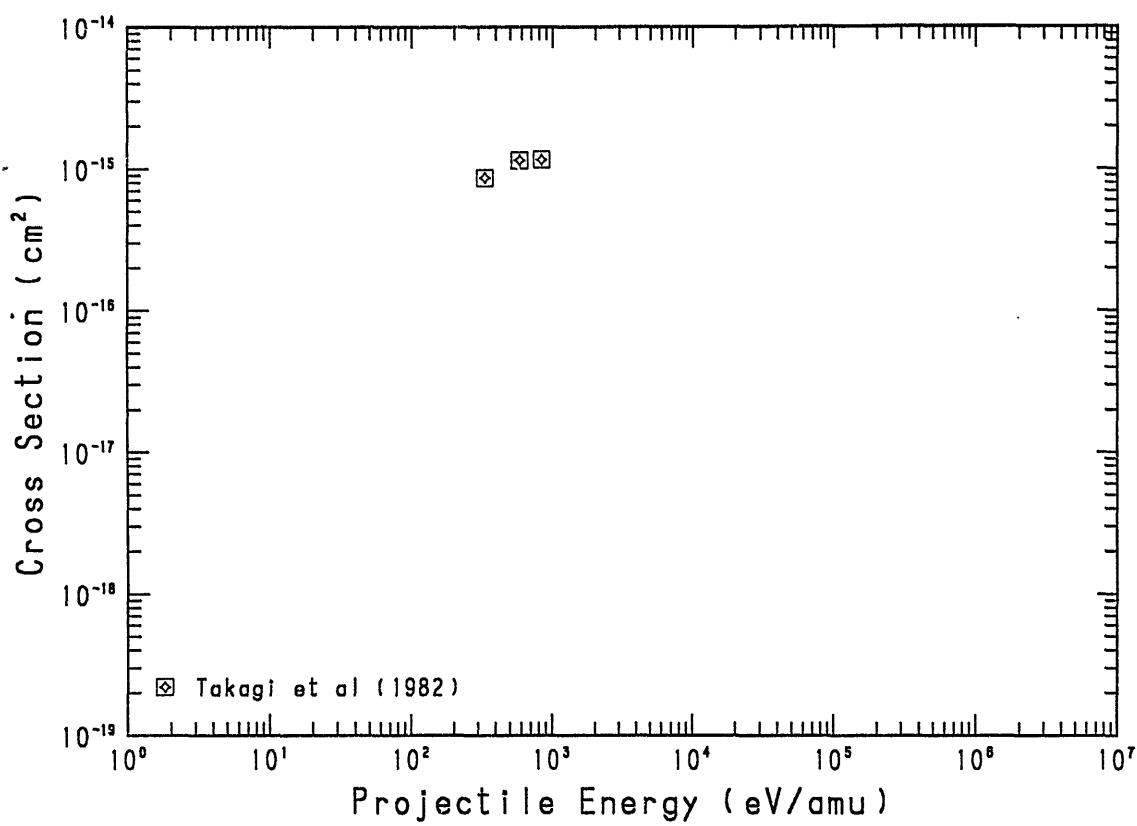


Fig. 6 $\text{Be}^{4+} + \text{H}_2 \rightarrow \text{Be}^{3+}$

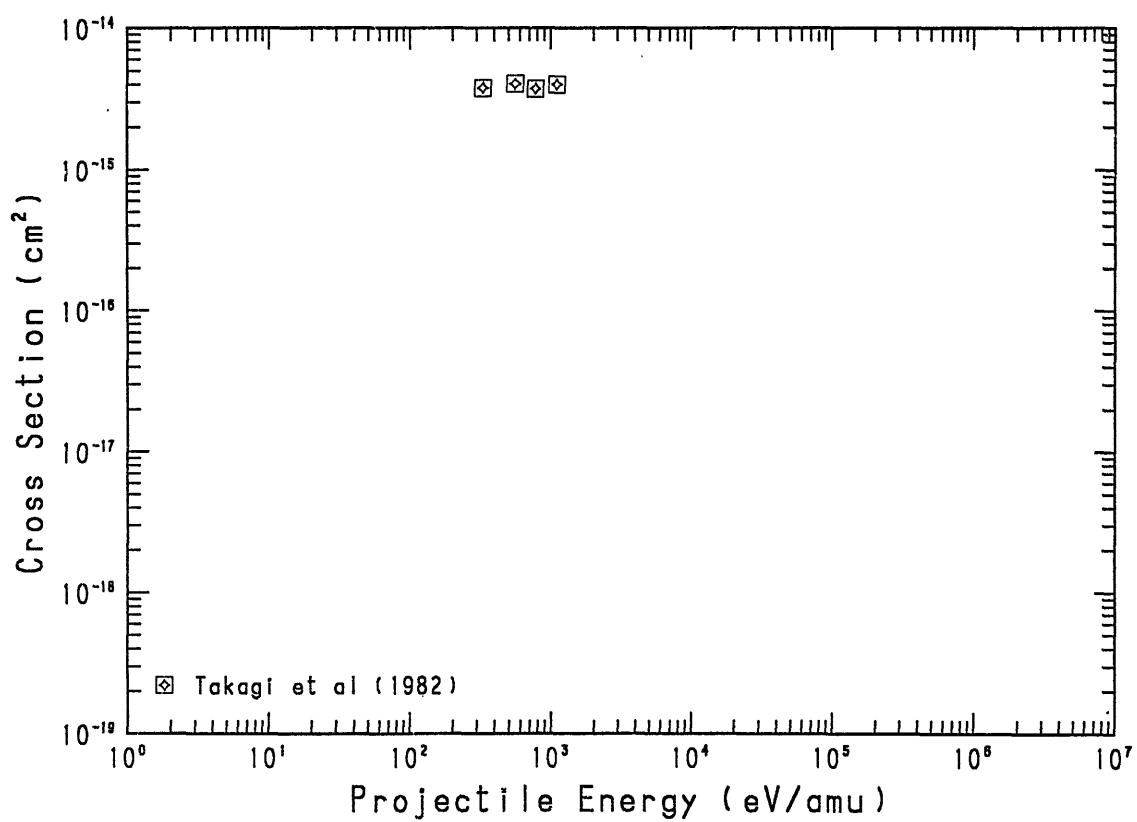


Fig. 7 $B^+ + H_2 \rightarrow B$

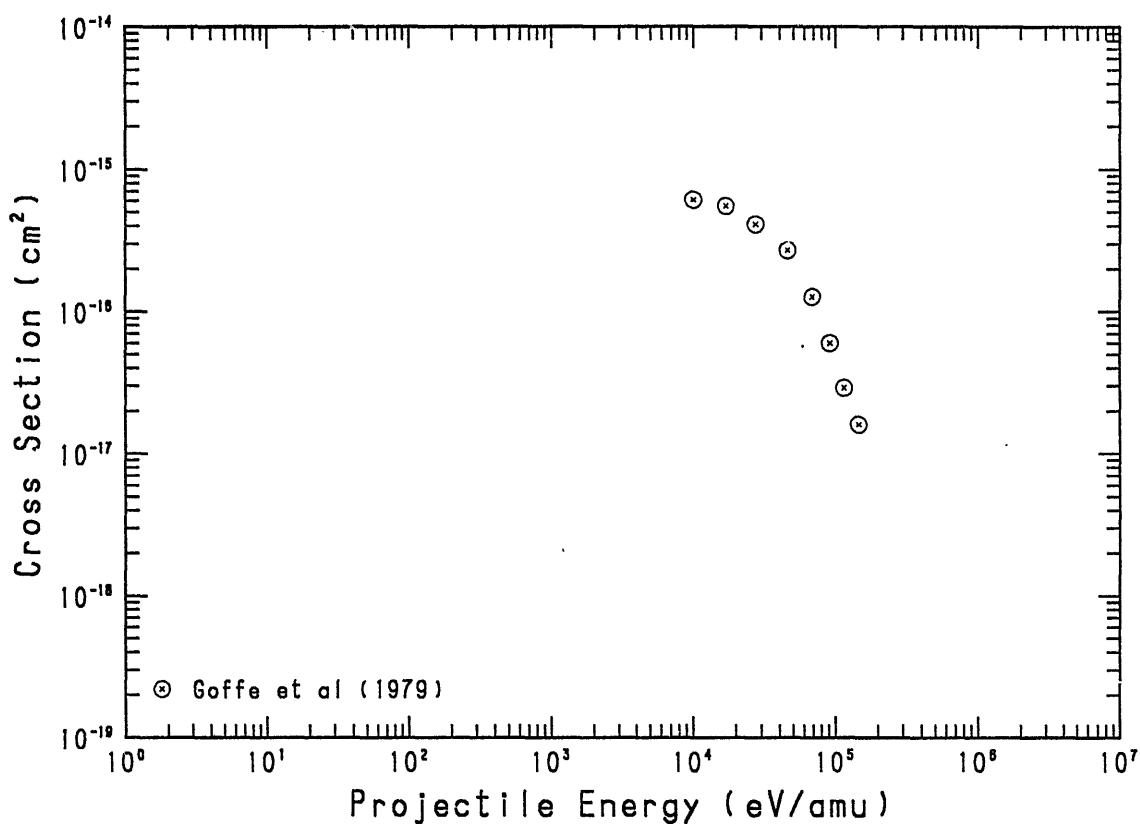


Fig. 8 $B^{2+} + H_2 \rightarrow B^+$

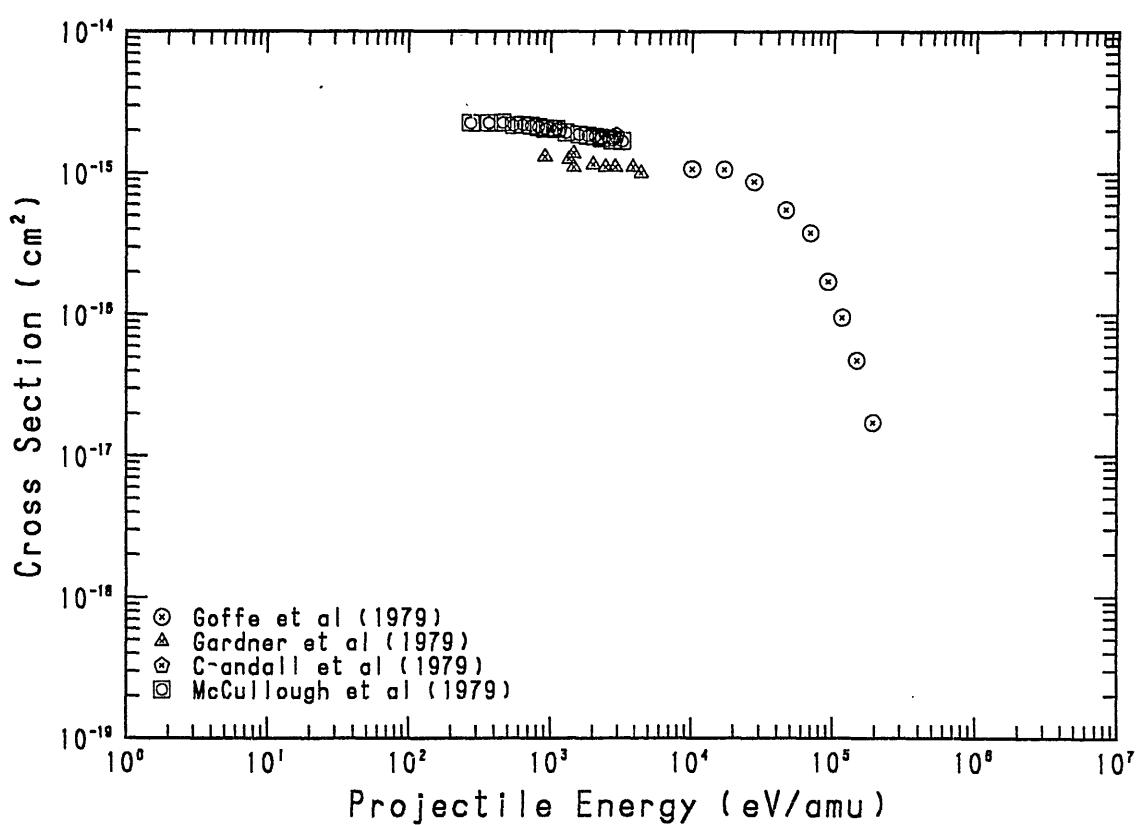


Fig. 9 $B^{3+} + H_2 \rightarrow B^+$

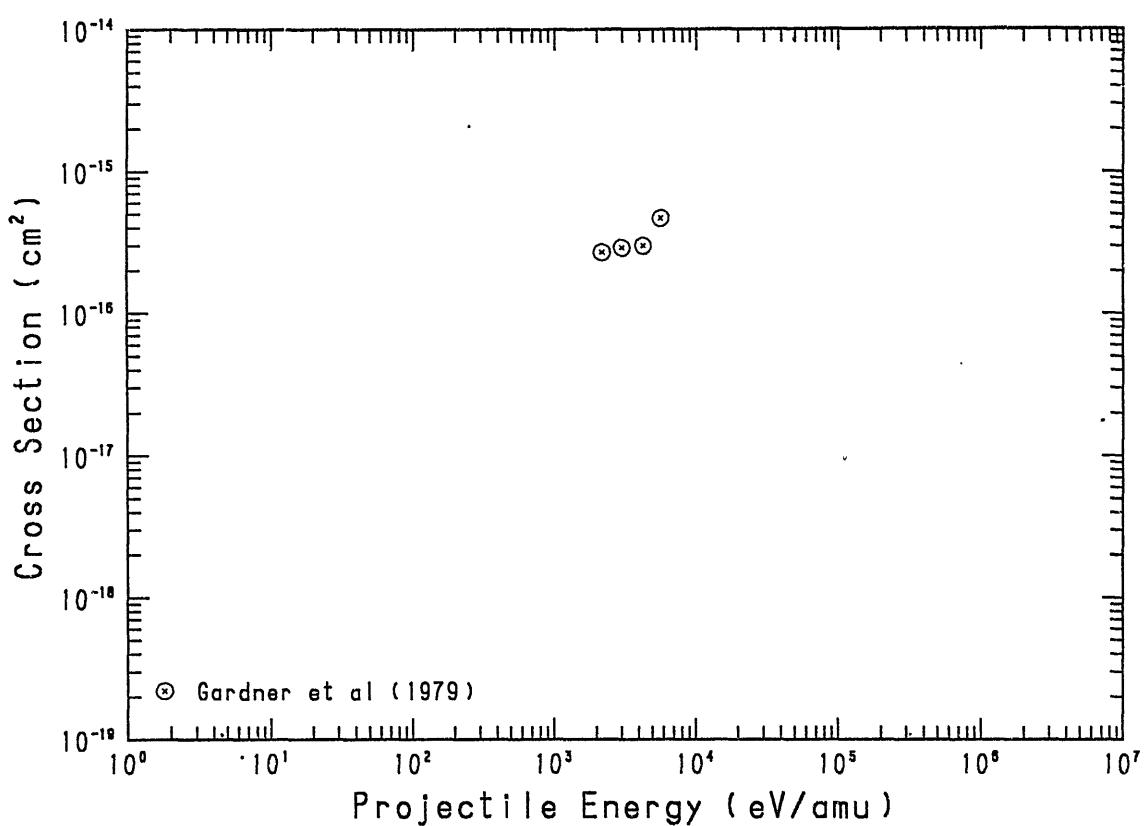


Fig. 10 $B^{3+} + H_2 \rightarrow B^{2+}$

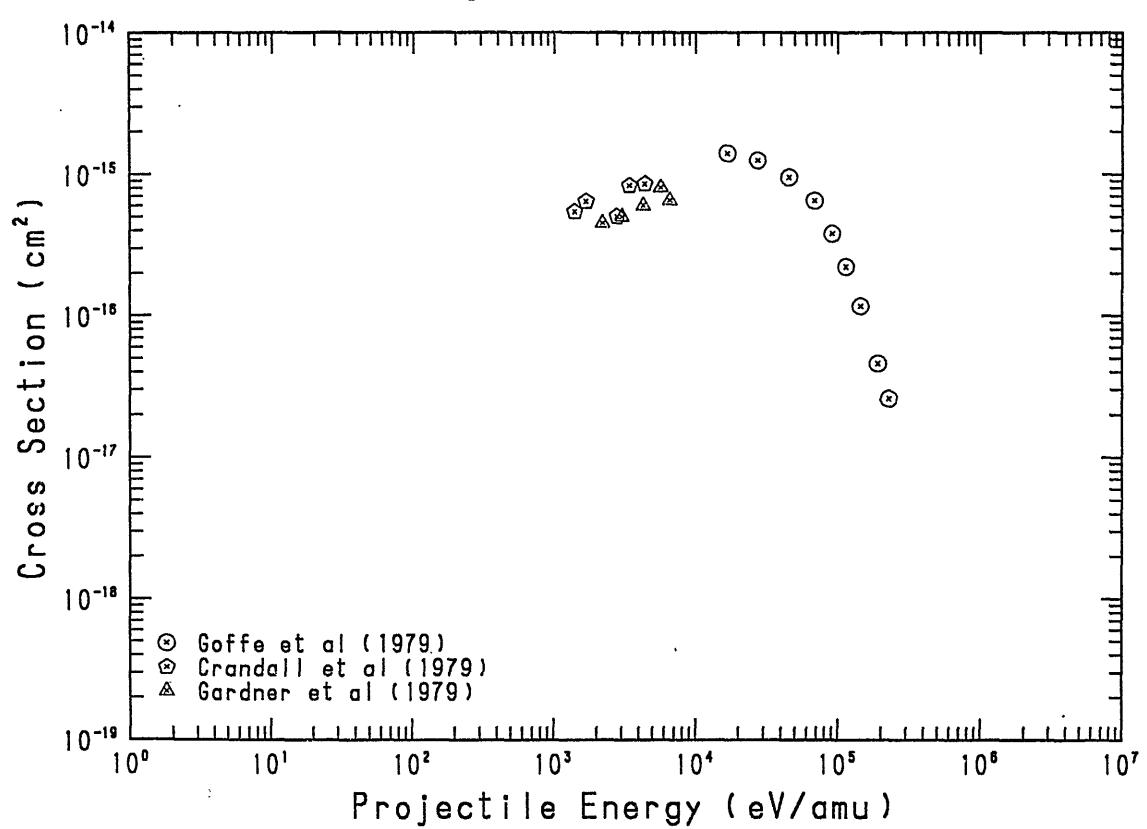


Fig. 11 $B^{4+} + H_2 \rightarrow B^{2+}$

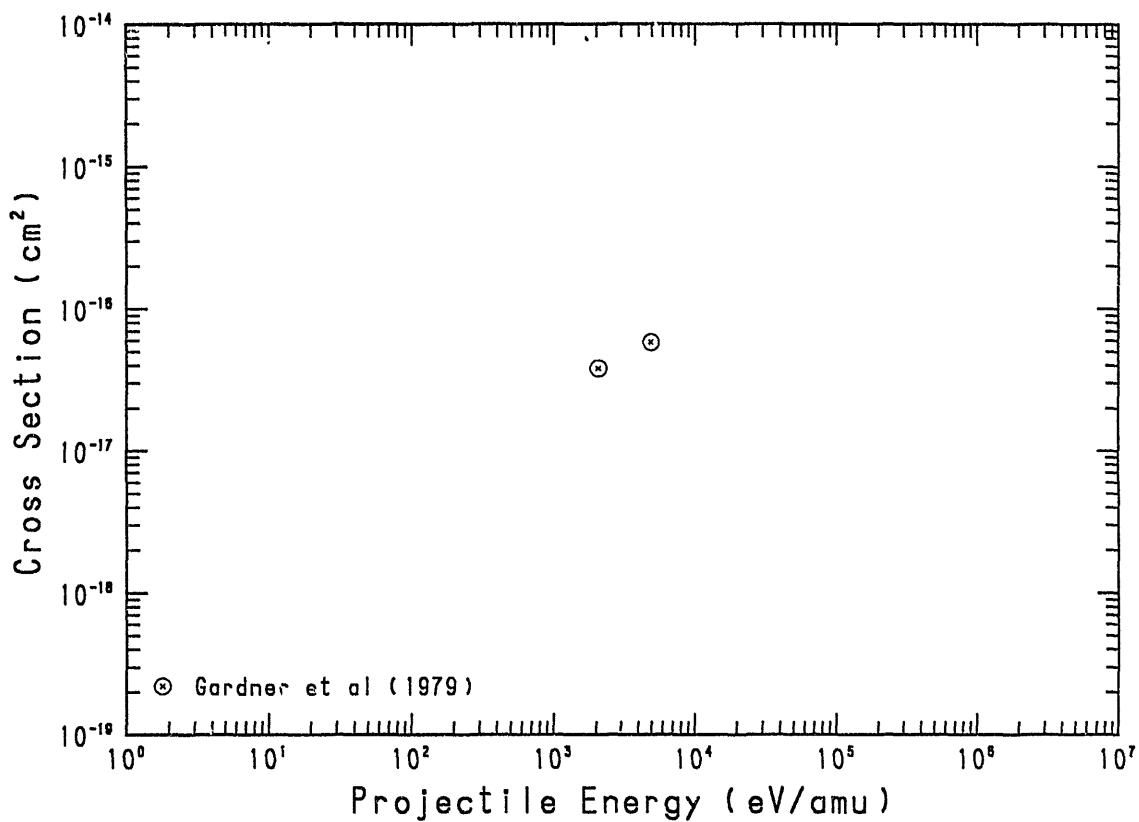


Fig. 12 $B^{4+} + H_2 \rightarrow B^{3+}$

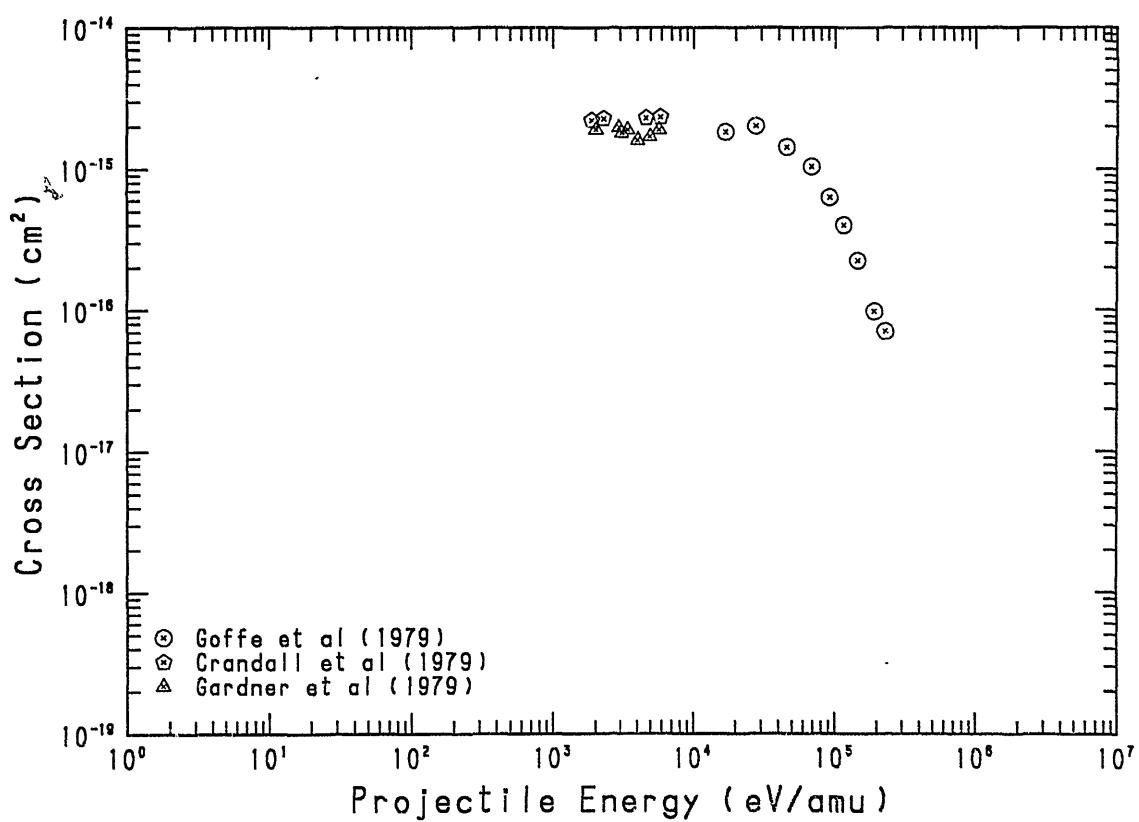


Fig. 13 $B^{5+} + H_2 \rightarrow B^{4+}$

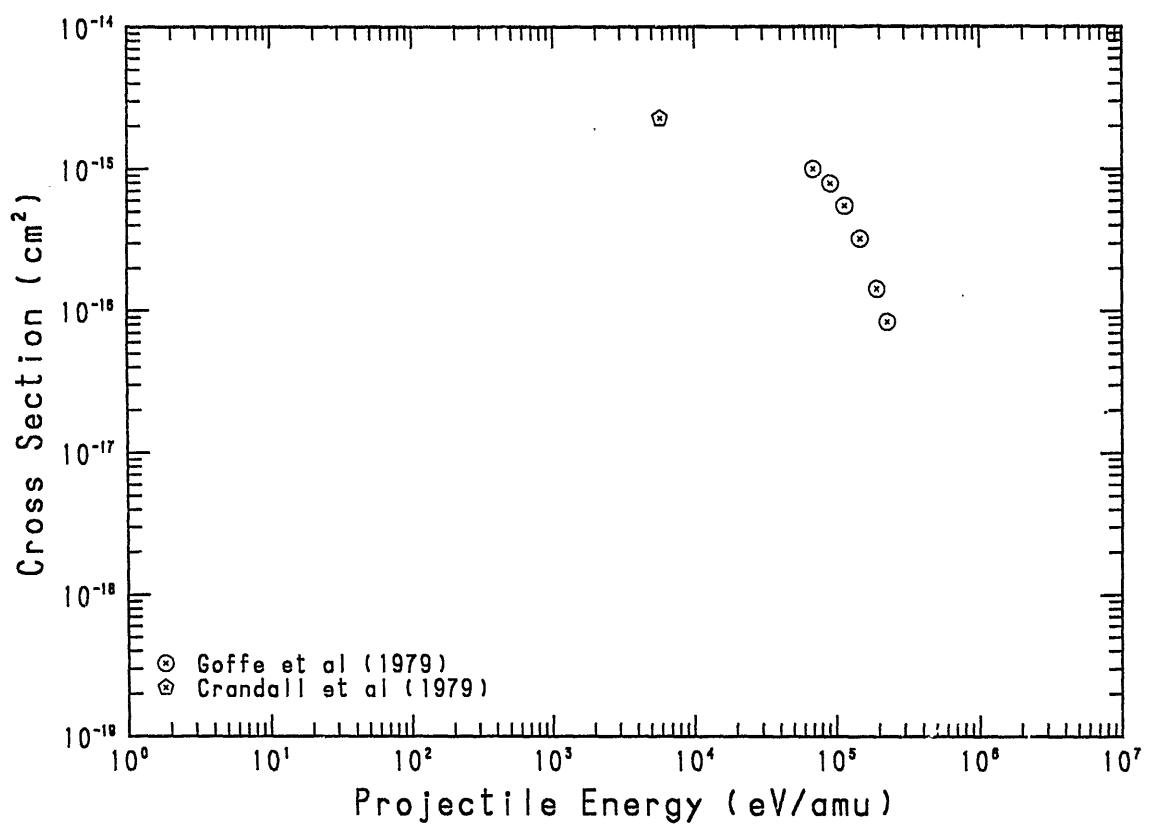


Fig. 14 $C^+ + H_2 \rightarrow C$

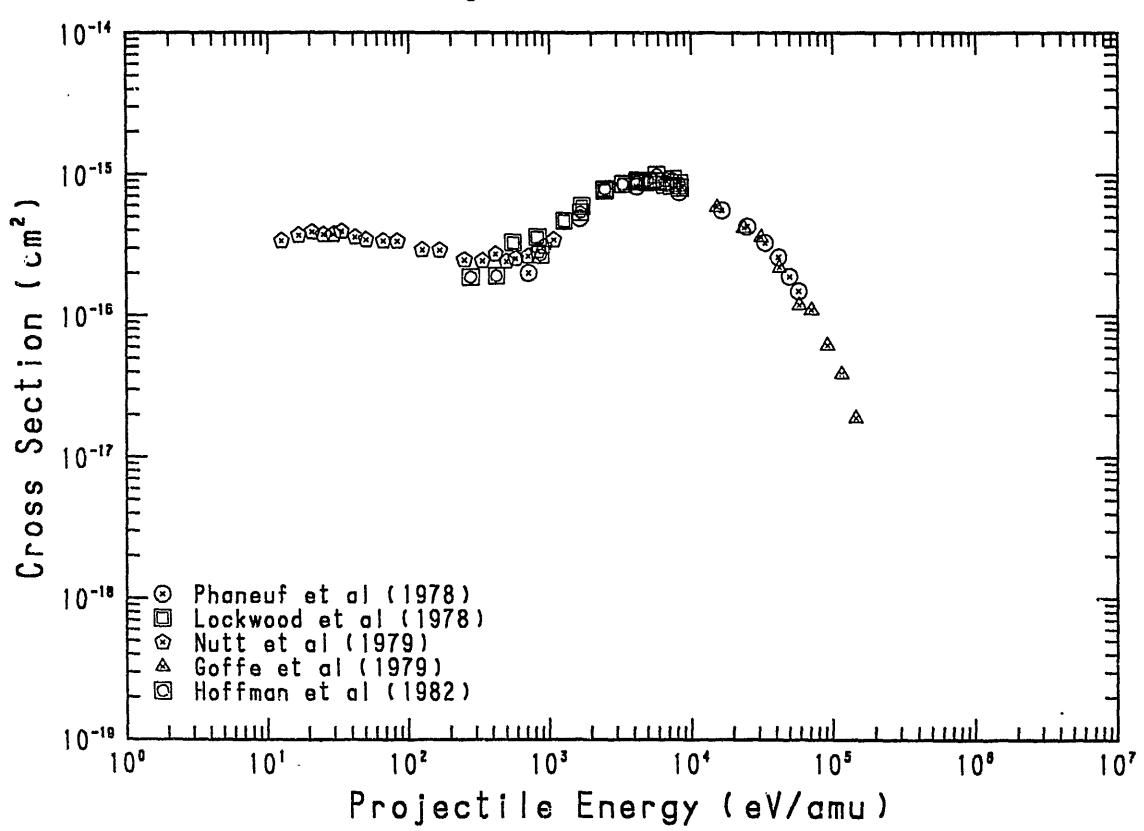


Fig.15 $\text{C}^{2+} + \text{H}_2 \rightarrow \text{C}^+$

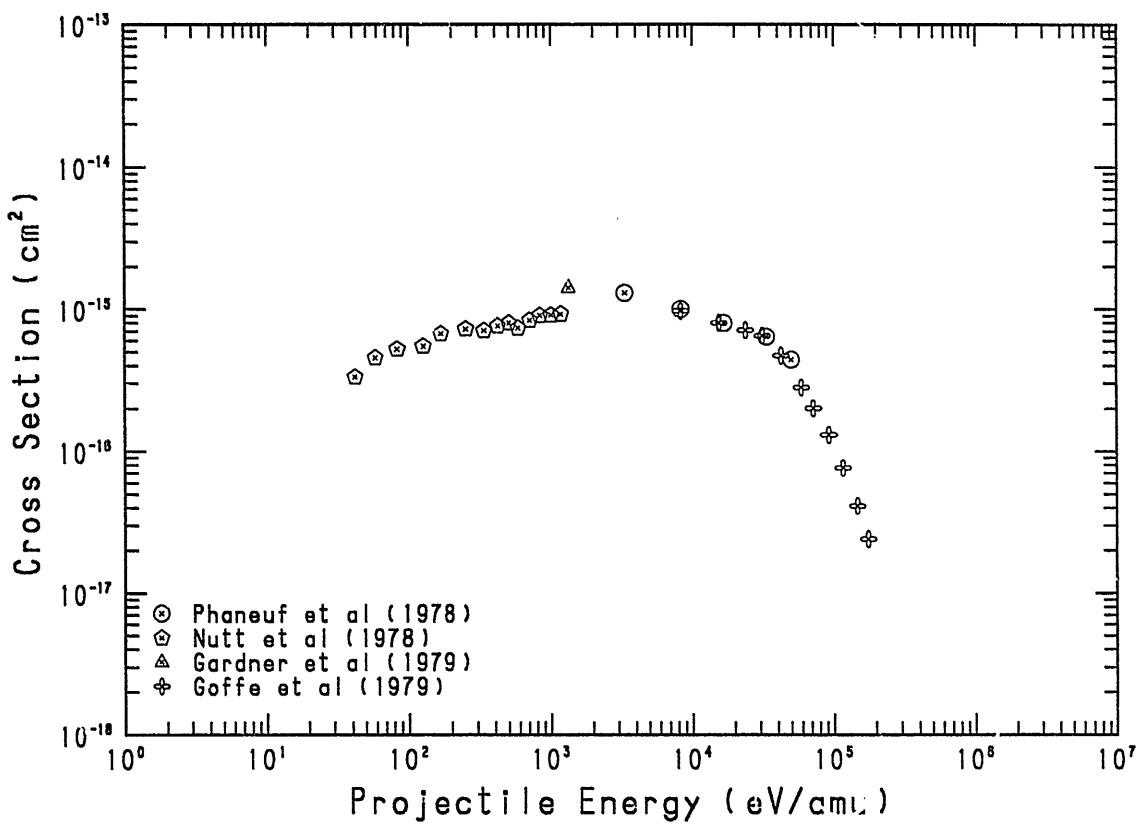


Fig.16 $\text{C}^{3+} + \text{H}_2 \rightarrow \text{C}^{2+}$

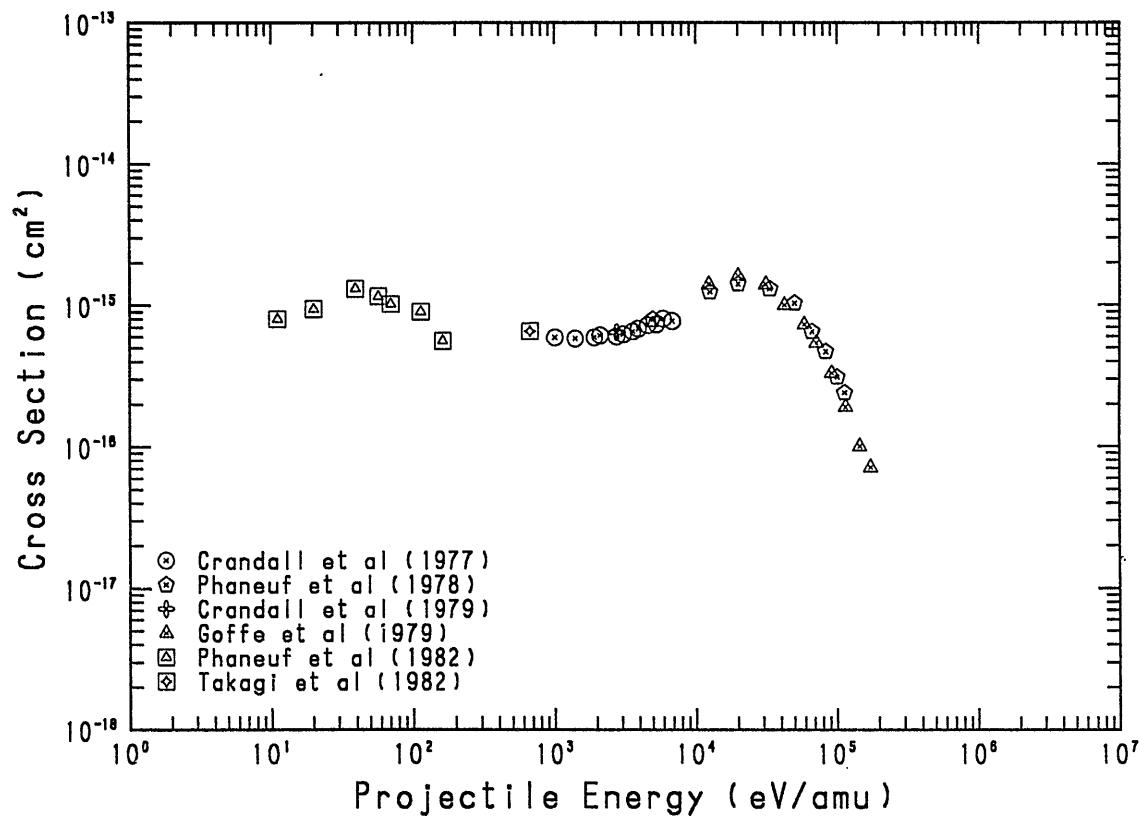


Fig. 17 $\text{C}^{4+} + \text{H}_2 \rightarrow \text{C}^{2+}$

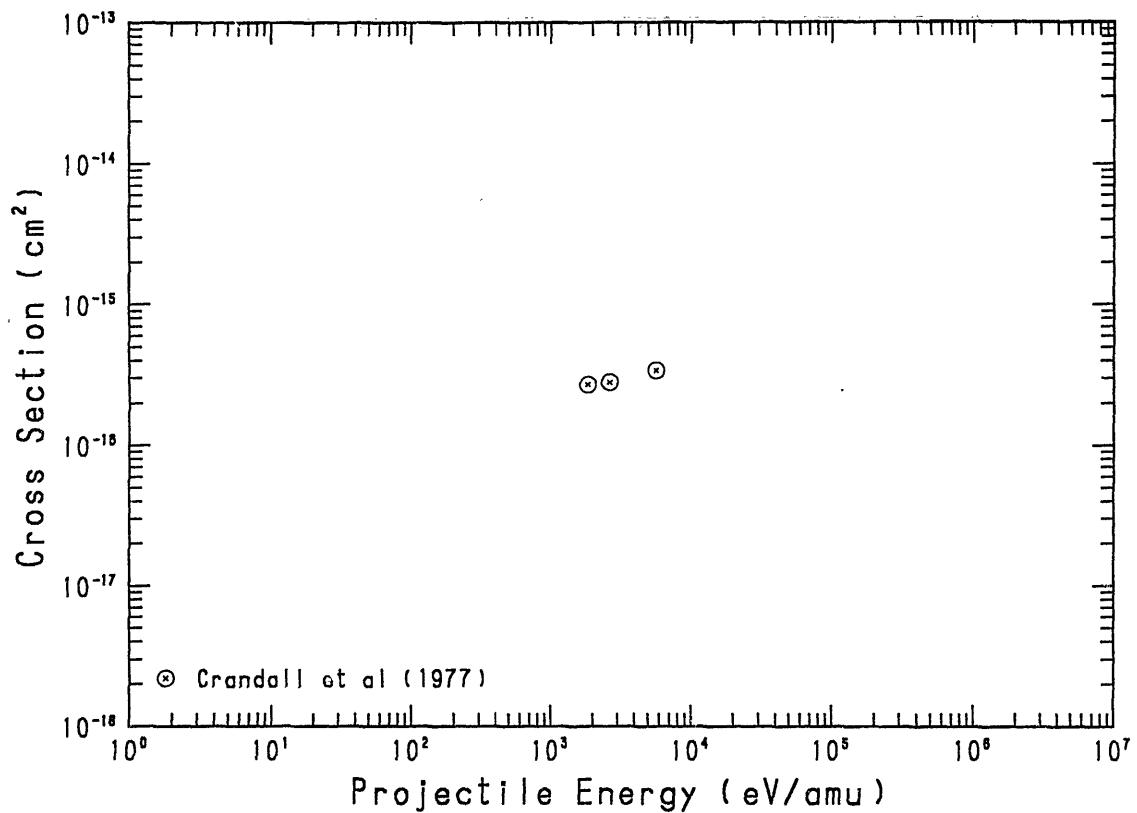


Fig. 18 $\text{C}^{4+} + \text{H}_2 \rightarrow \text{C}^{3+}$

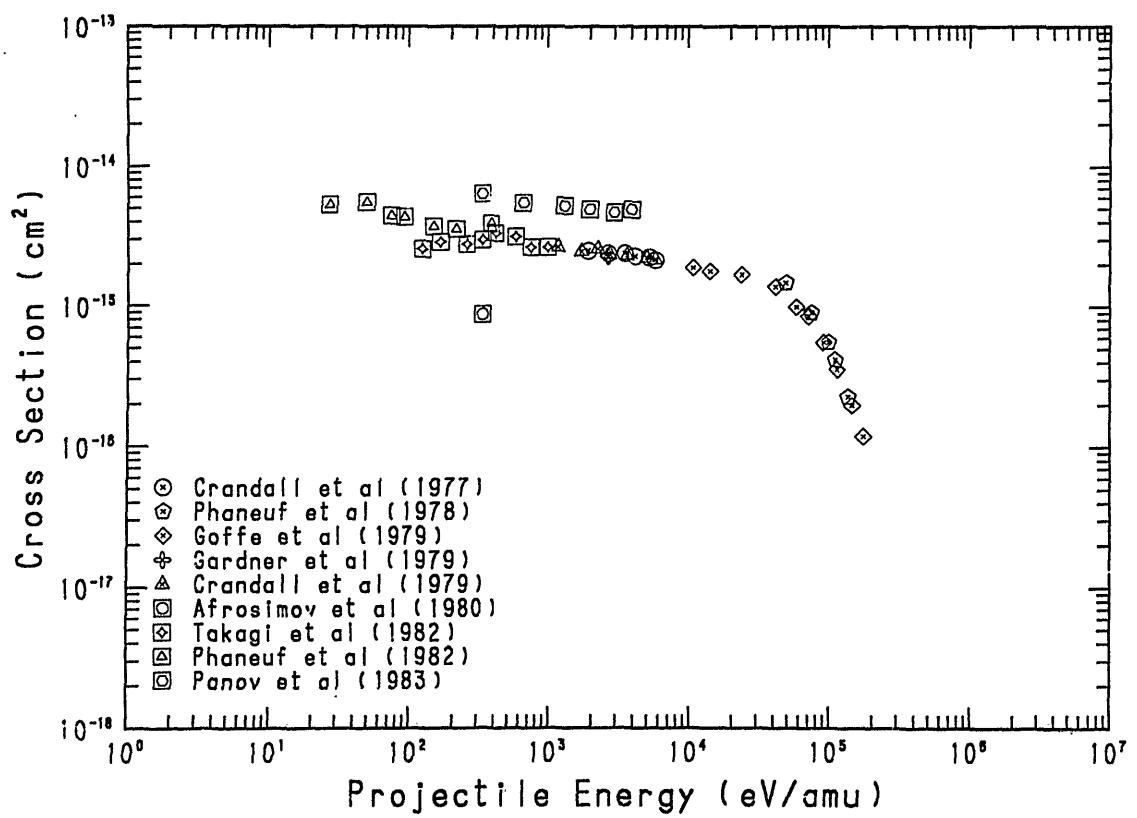


Fig.19 $\text{C}^{5+} + \text{H}_2 \rightarrow \text{C}^{4+}$

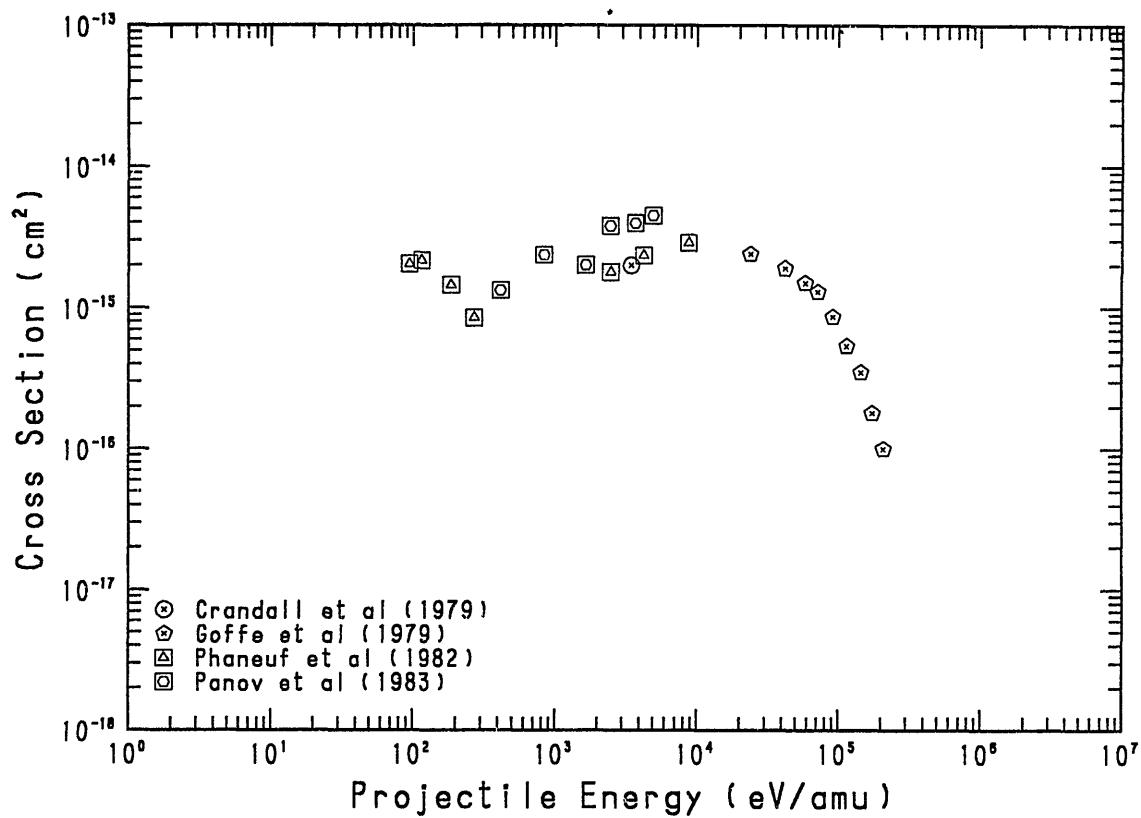


Fig.20 $\text{C}^{6+} + \text{H}_2 \rightarrow \text{C}^{5+}$

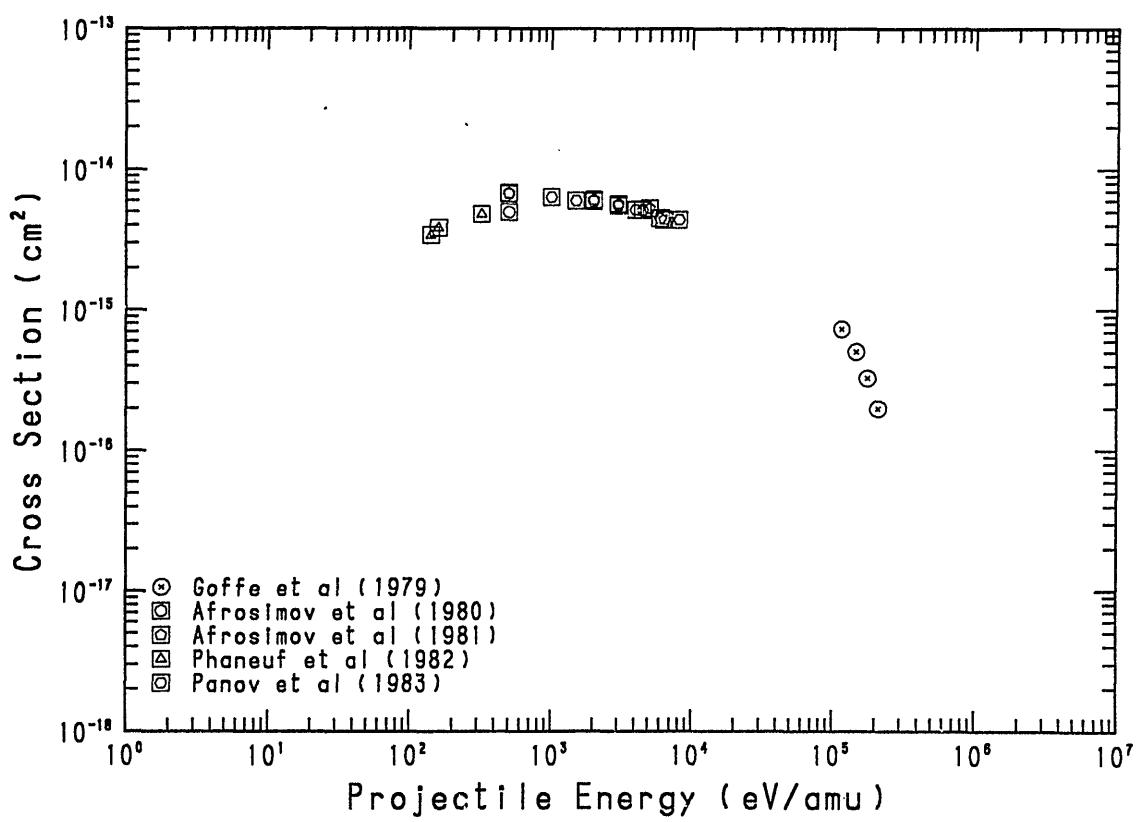


Fig. 21 $N^+ + H_2 \rightarrow N$

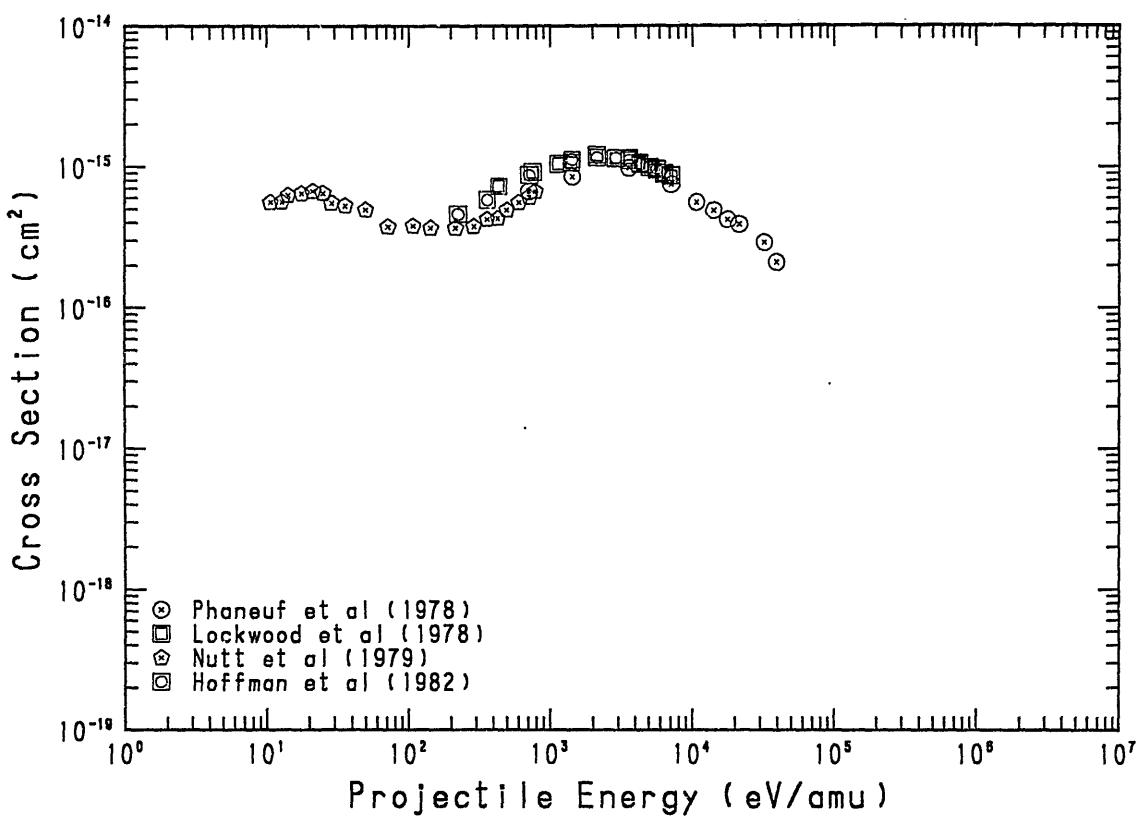


Fig. 22 $N^{2+} + H_2 \rightarrow N^+$

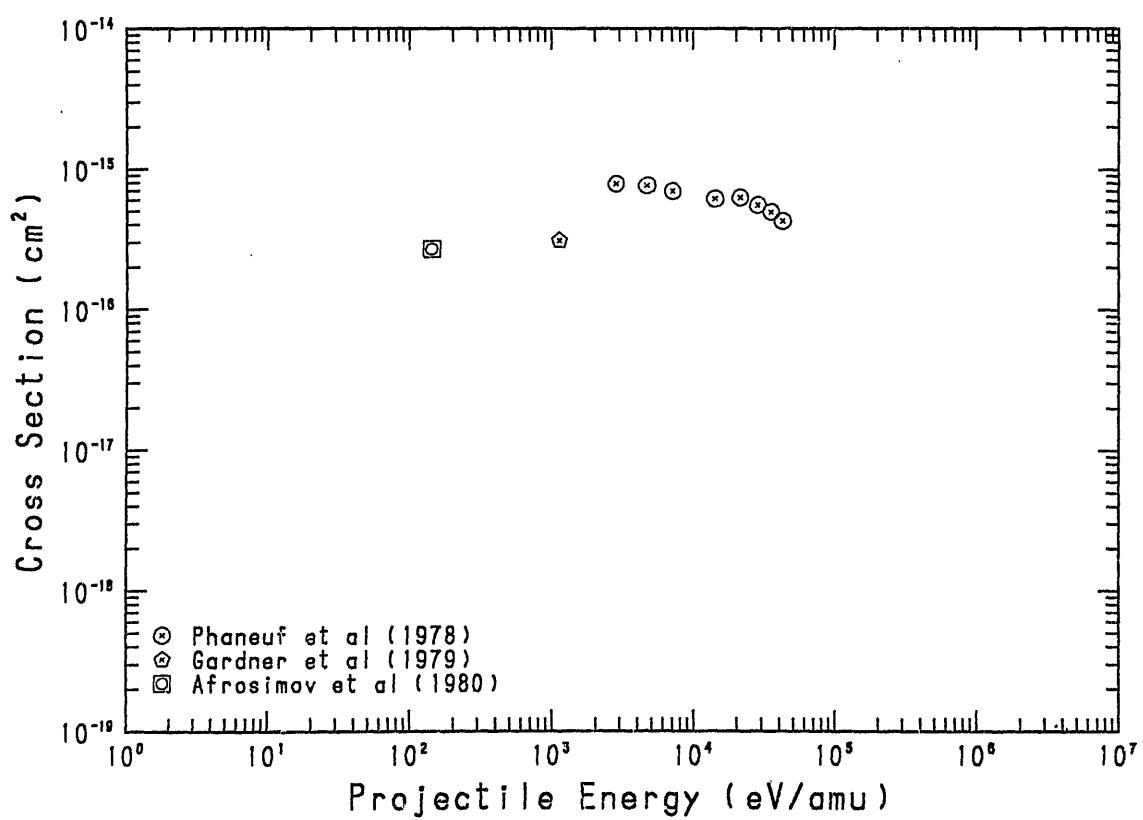


Fig. 23 $N^{3+} + H_2 \rightarrow N^{2+}$

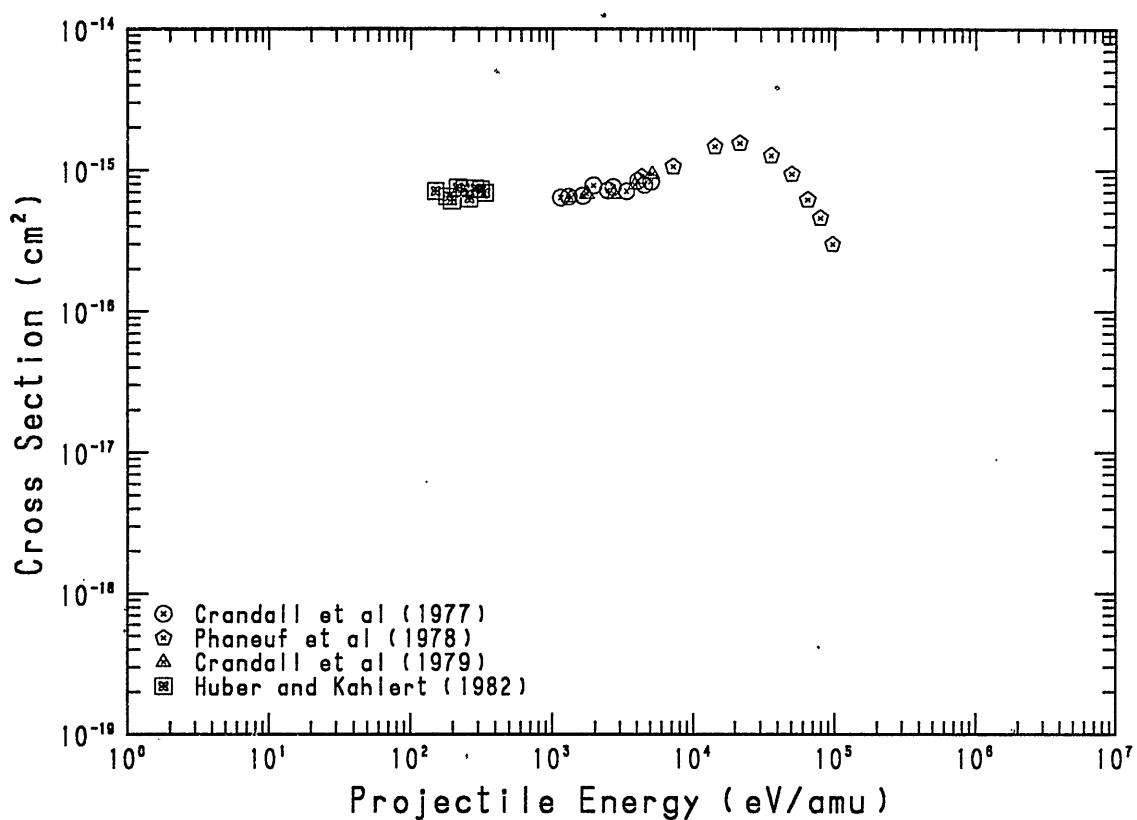


Fig. 24 $N^{4+} + H_2 \rightarrow N^{3+}$

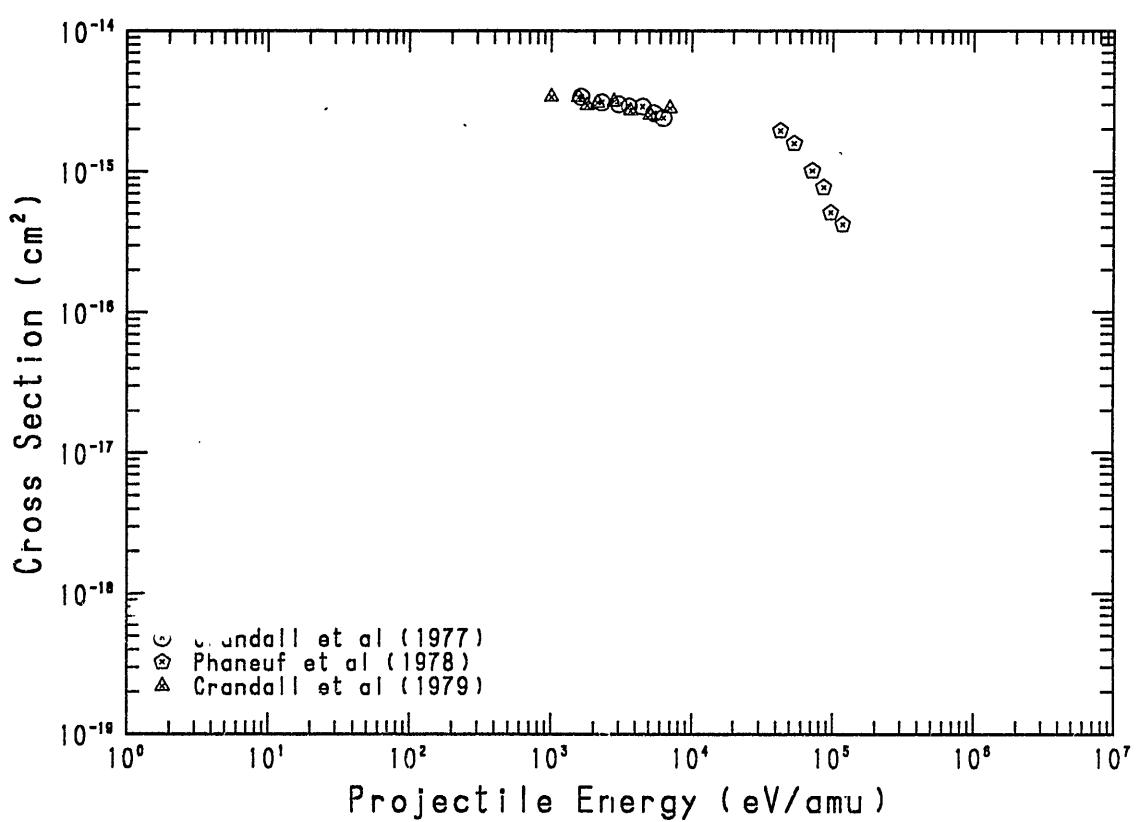


Fig. 25 $N^{5+} + H_2 \rightarrow N^{3+}$

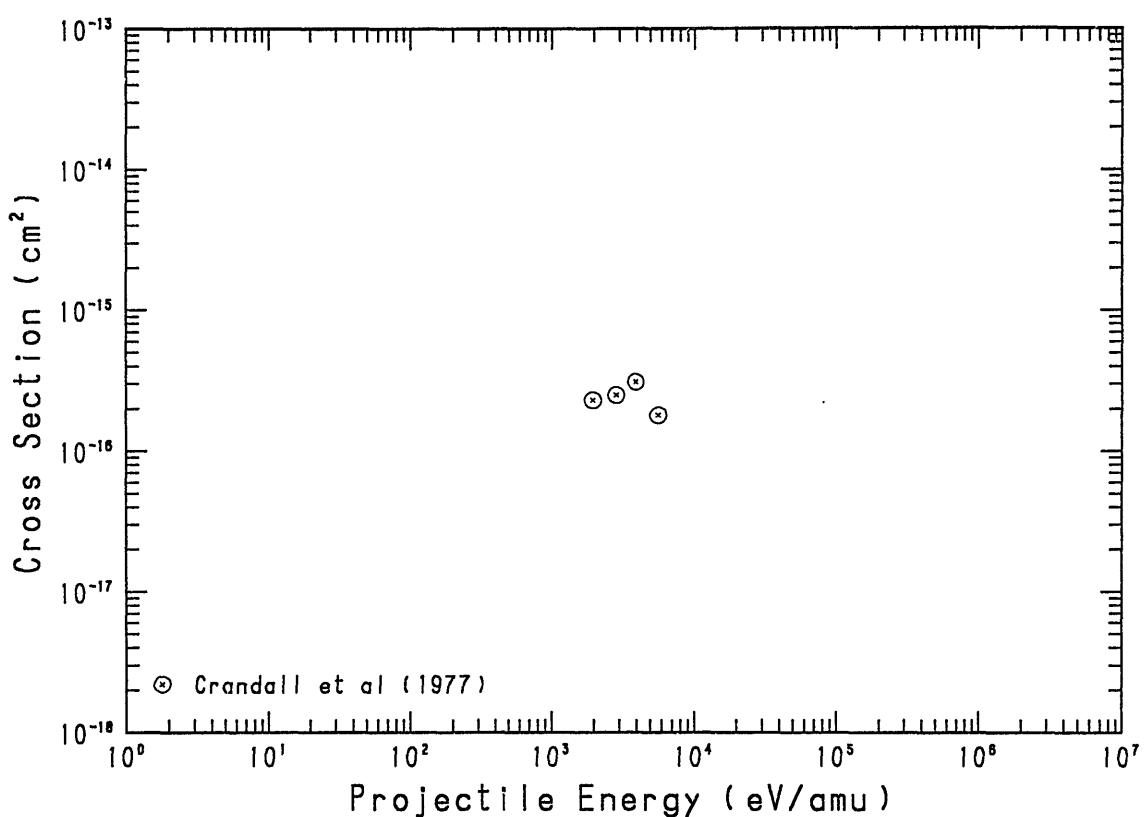


Fig. 26 $N^{5+} + H_2 \rightarrow N^{4+}$

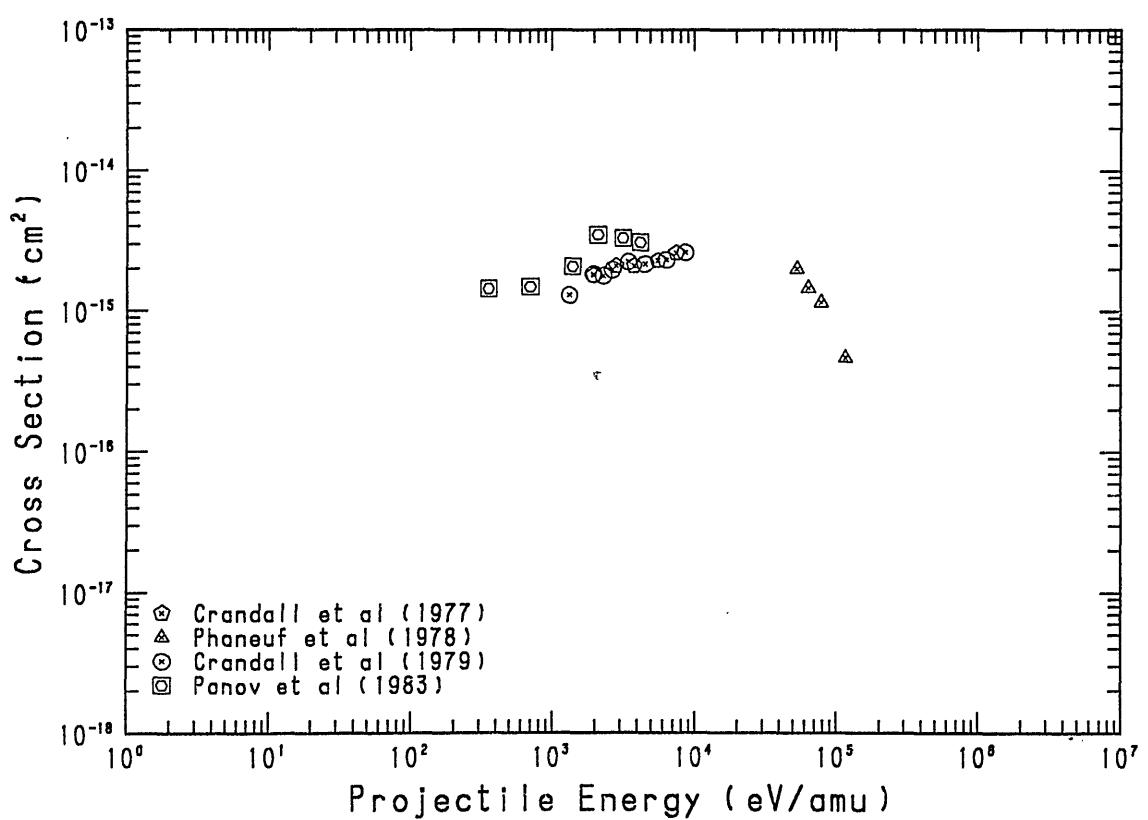


Fig.27 $N^{6+} + H_2 \rightarrow N^{5+}$

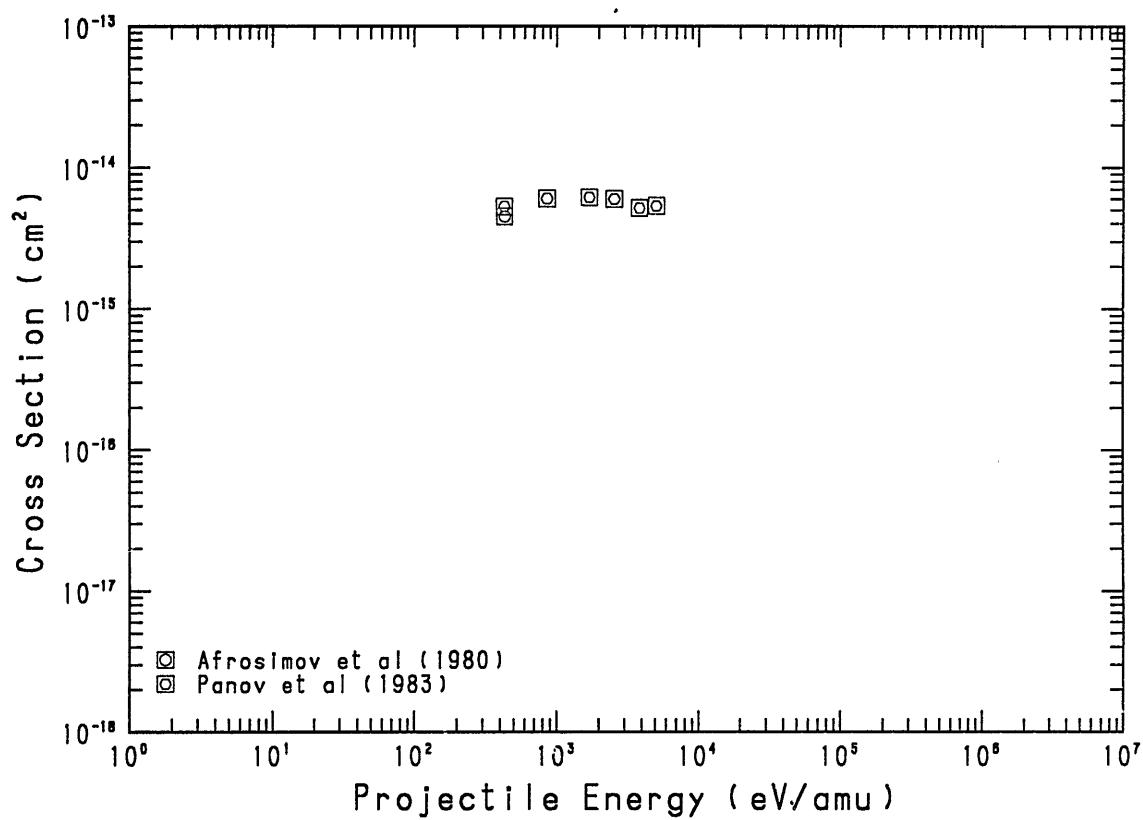


Fig.28 $N^{7+} + H_2 \rightarrow N^{6+}$

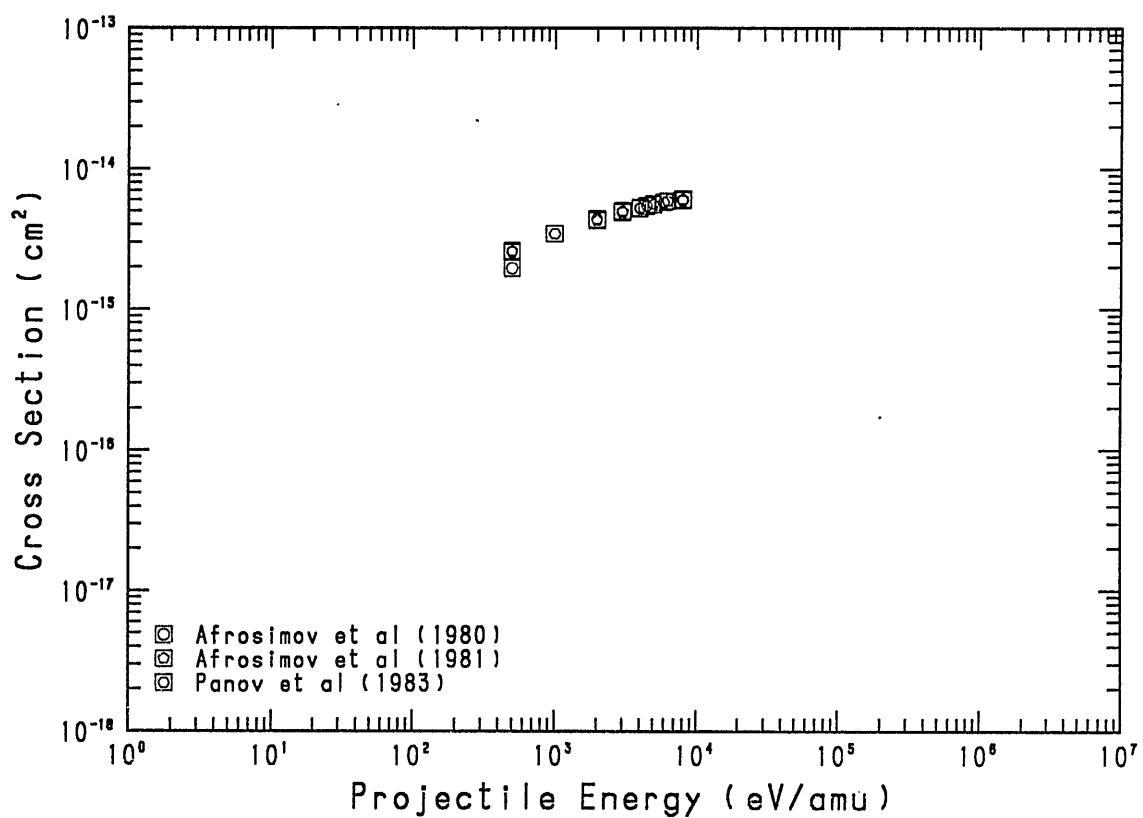


Fig. 29 $O^+ + H_2 \rightarrow O$

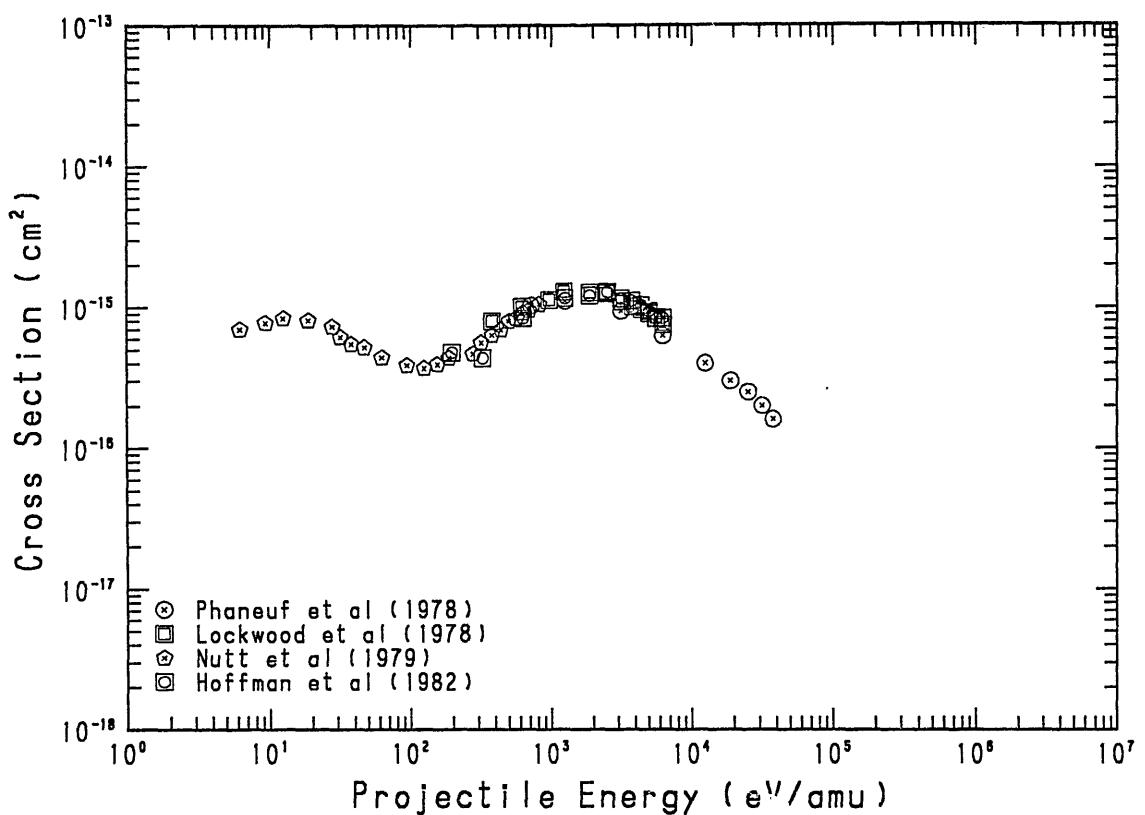


Fig. 30 $O^{2+} + H_2 \rightarrow O$

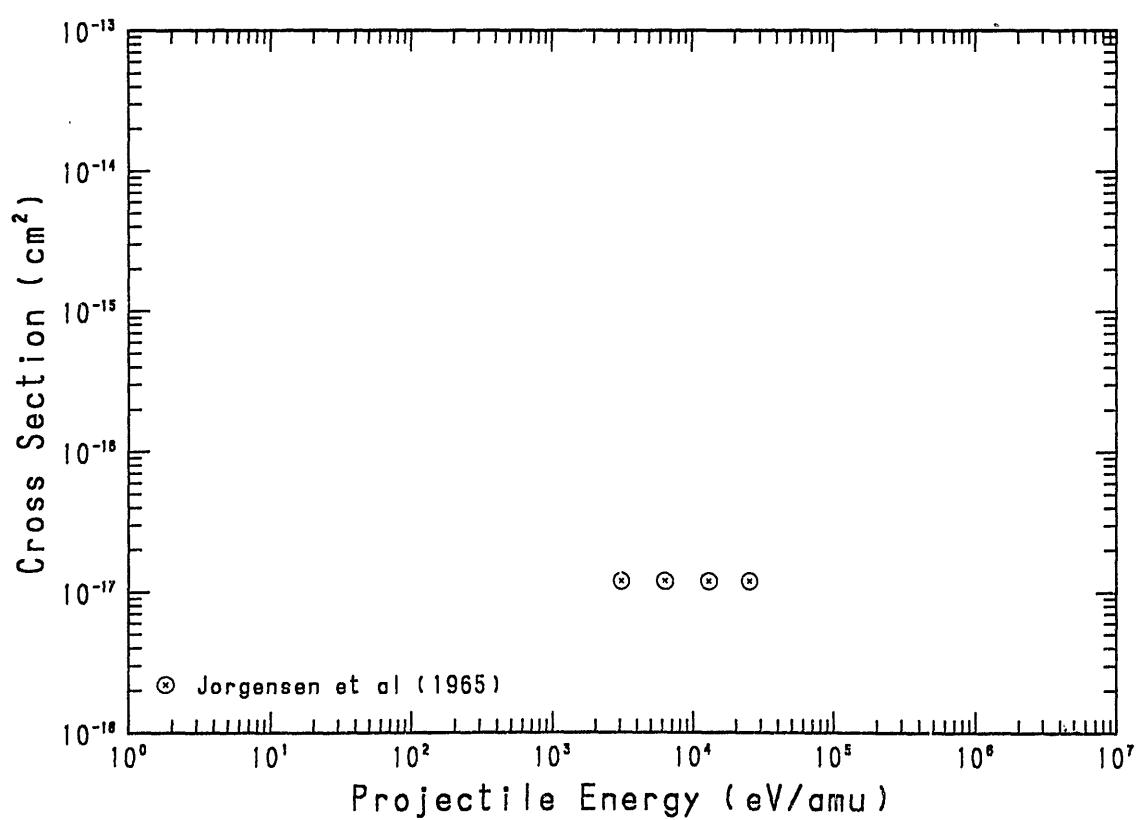


Fig. 31 $O^{2+} + H_2 \rightarrow O^+$

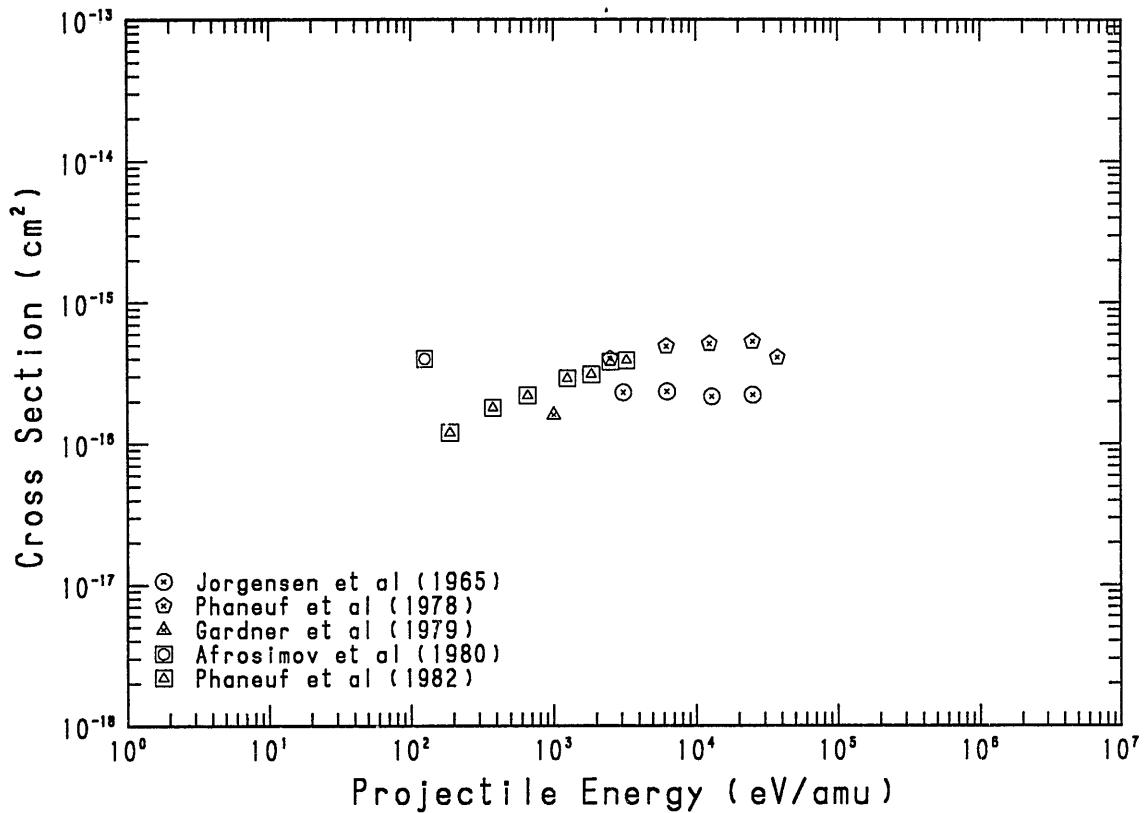


Fig. 32 $O^{3+} + H_2 \rightarrow O^{2+}$

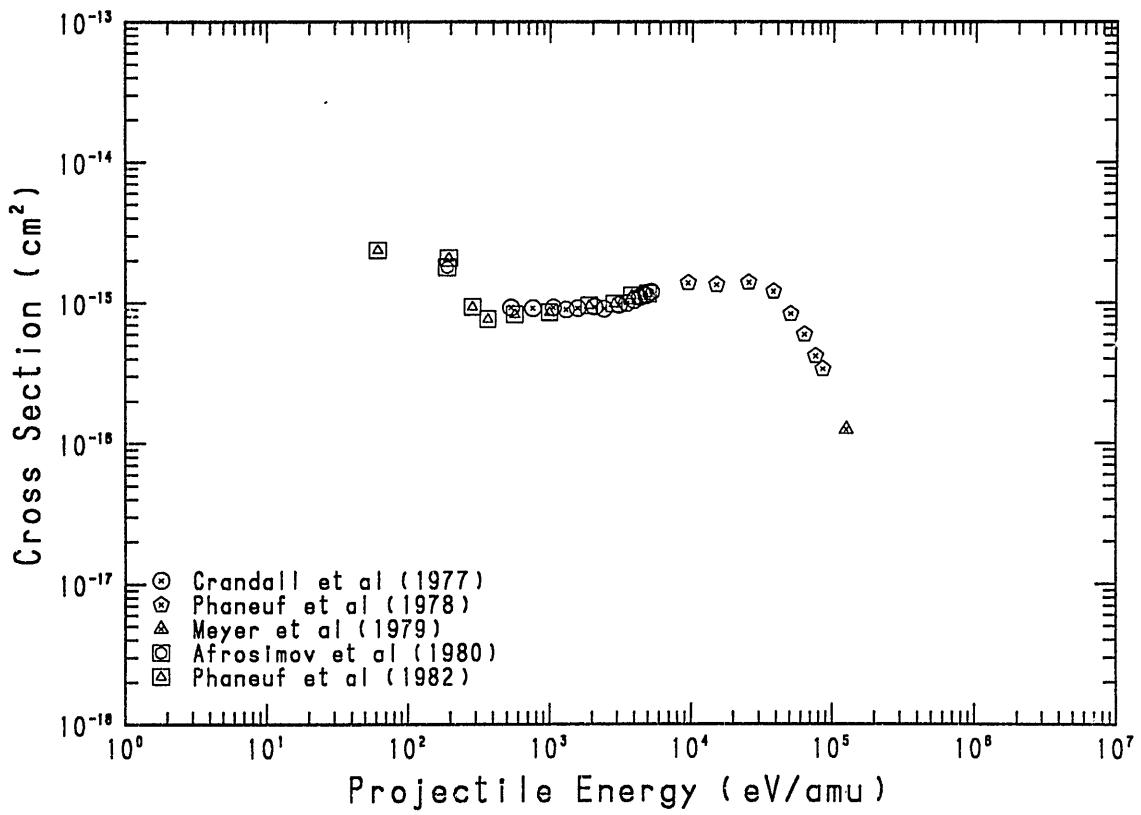


Fig.33 $O^{4+} + H_2 \rightarrow O^{3+}$

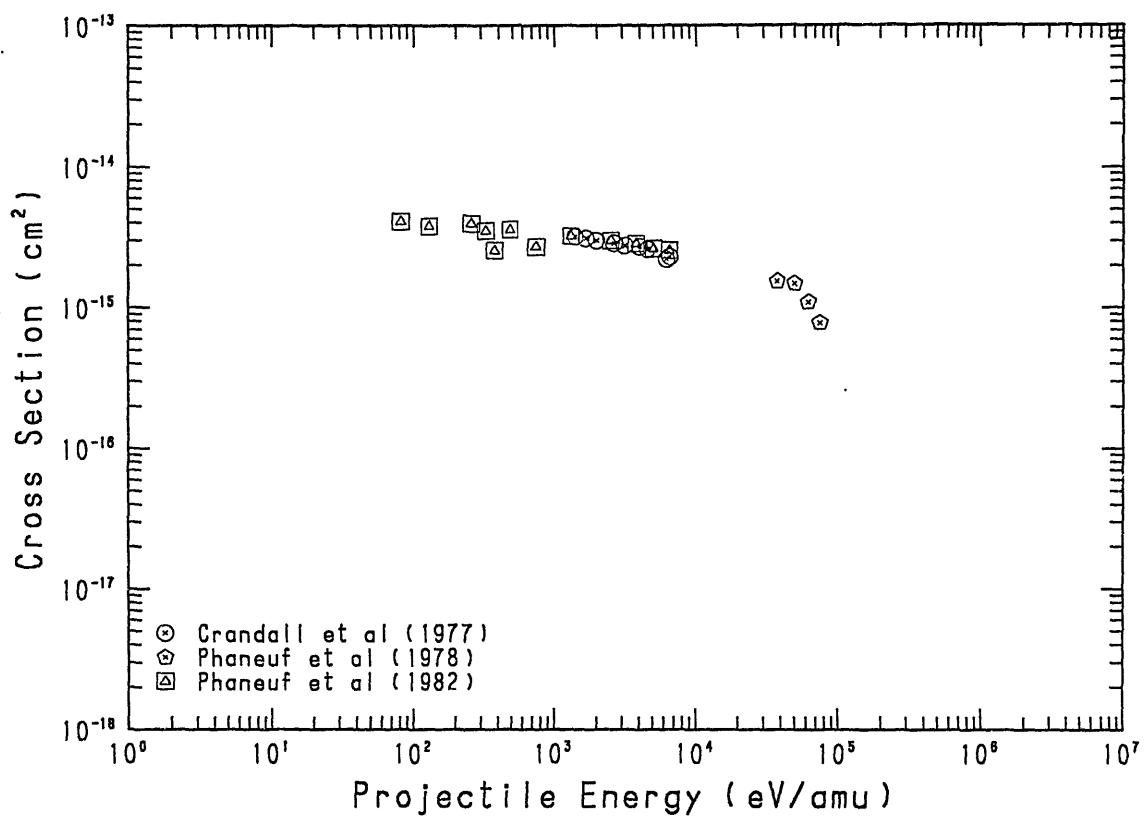


Fig.34 $O^{5+} + H_2 \rightarrow O^{3+}$

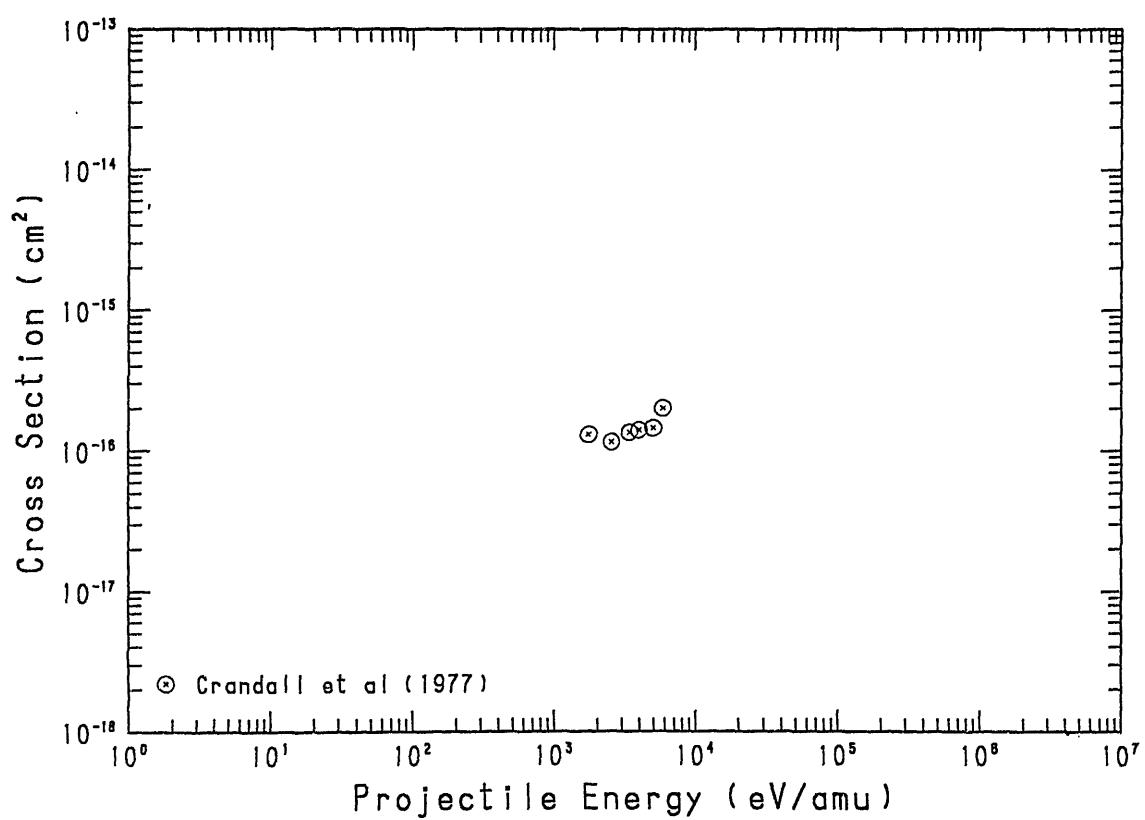


Fig.35 $O^{5+} + H_2 \rightarrow O^{4+}$

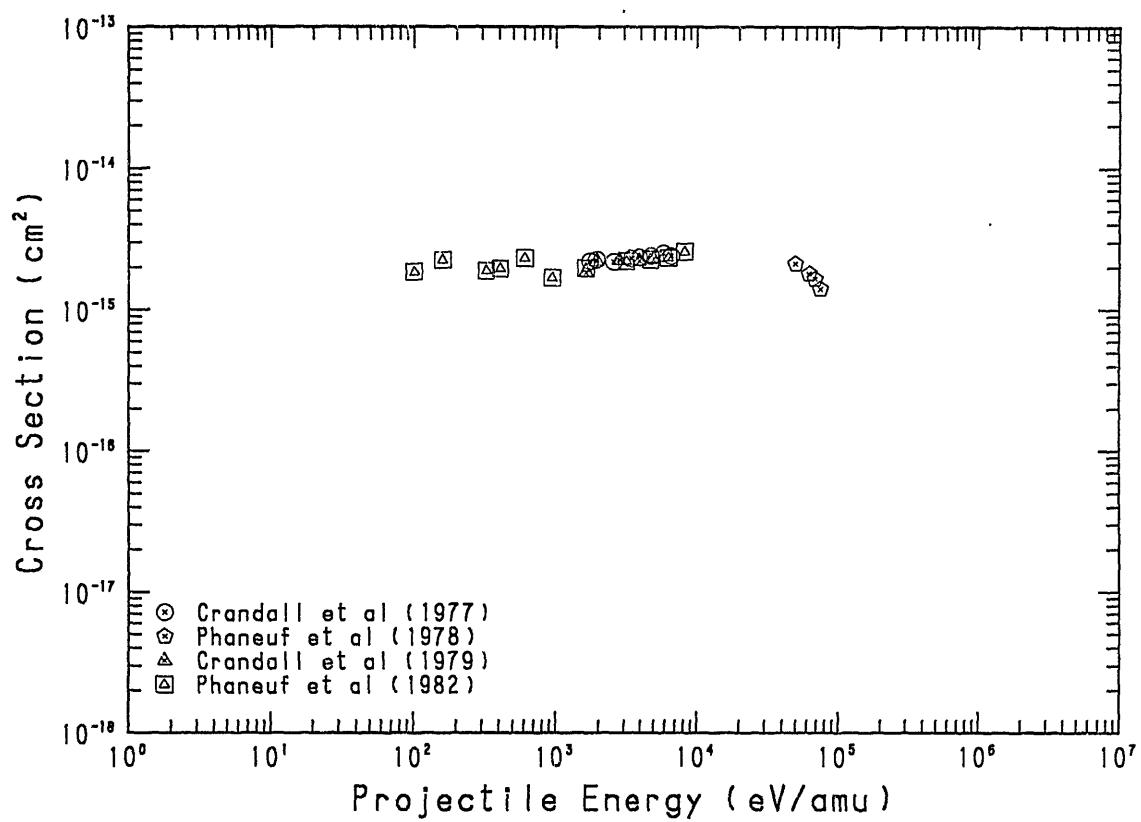


Fig.36 $O^{6+} + H_2 \rightarrow O^{4+}$

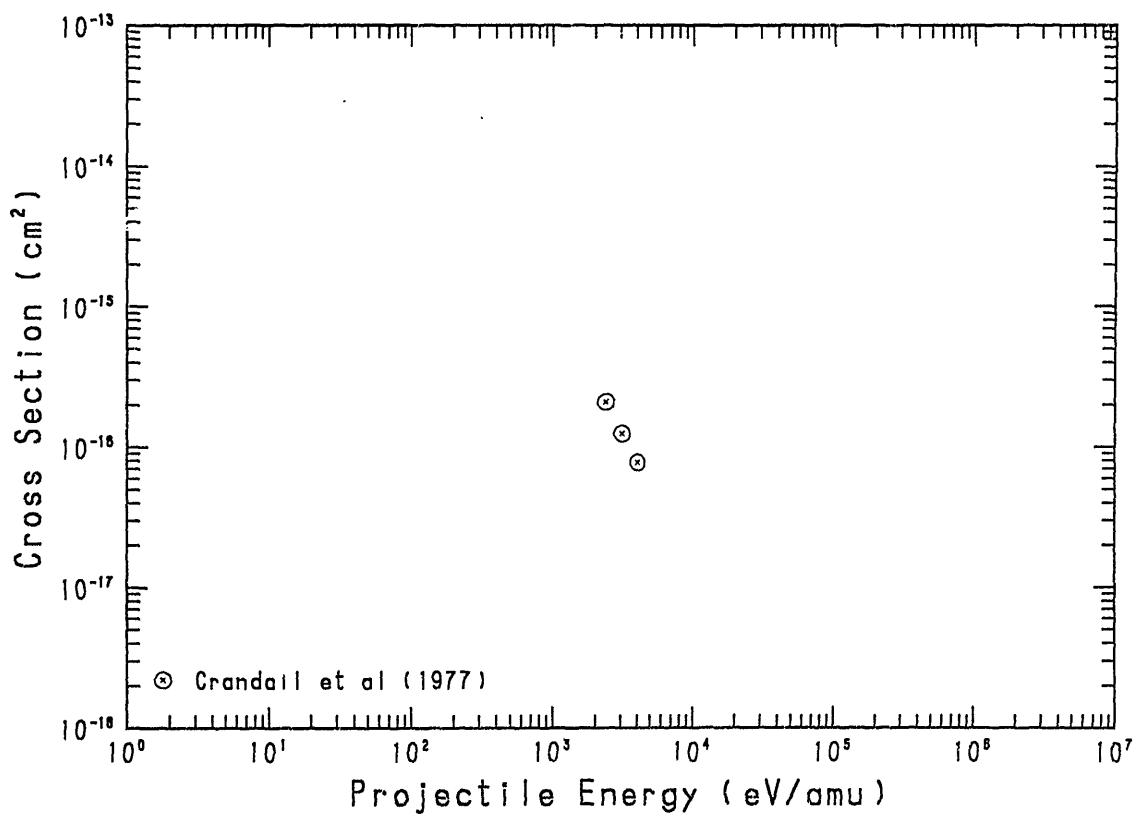


Fig.37 $O^{6+} + H_2 \rightarrow O^{5+}$

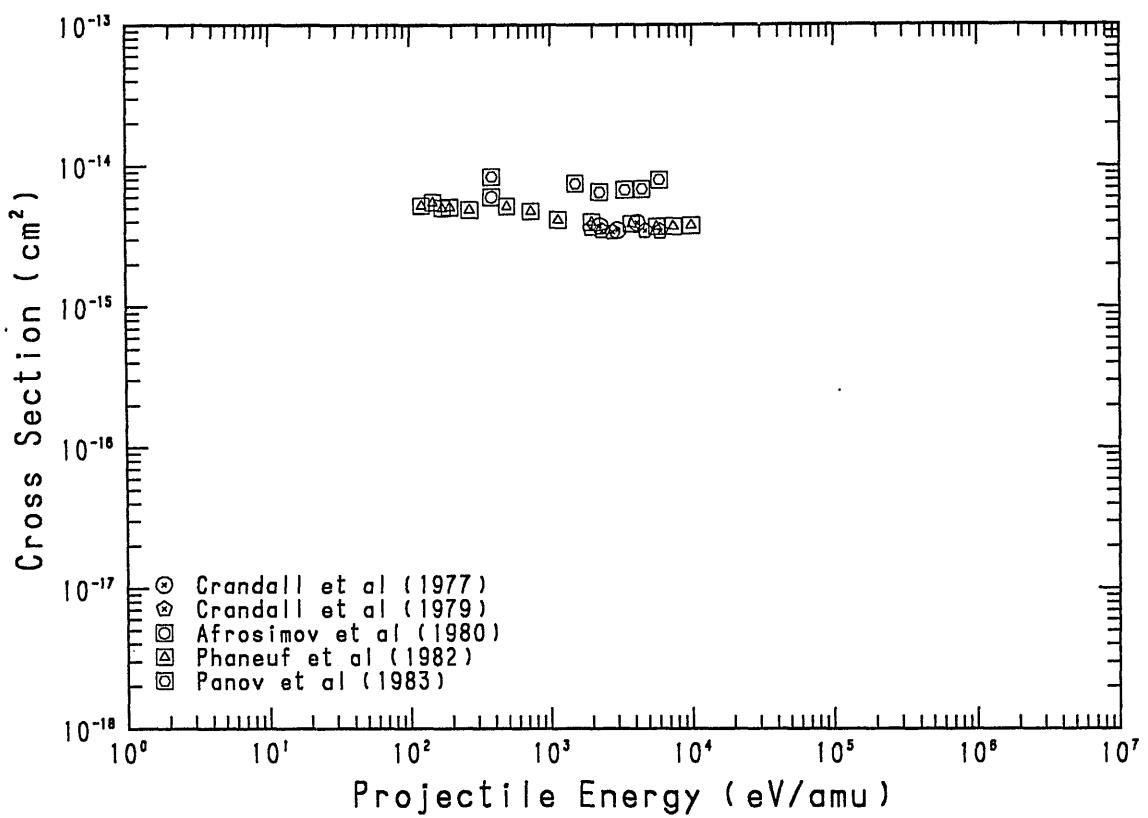


Fig.38 $O^{7+} + H_2 \rightarrow O^{6+}$

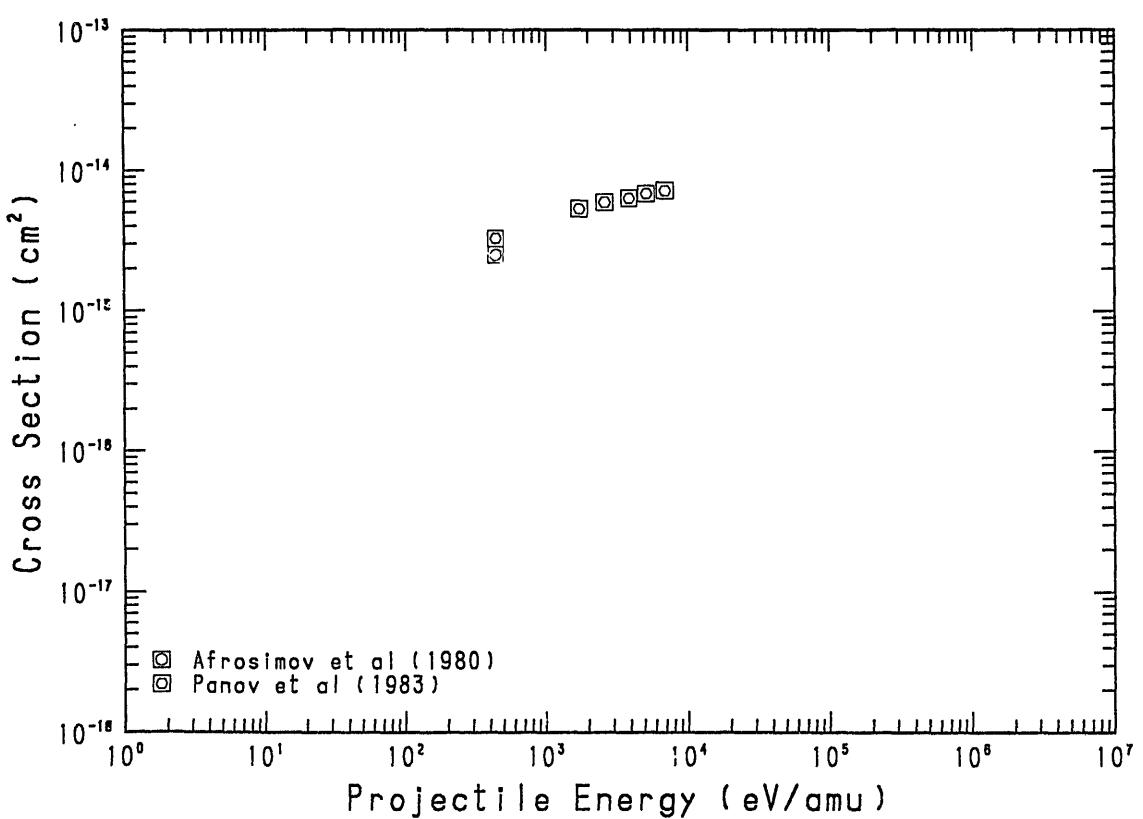


Fig.39 $O^{8+} + H_2 \rightarrow O^{7+}$

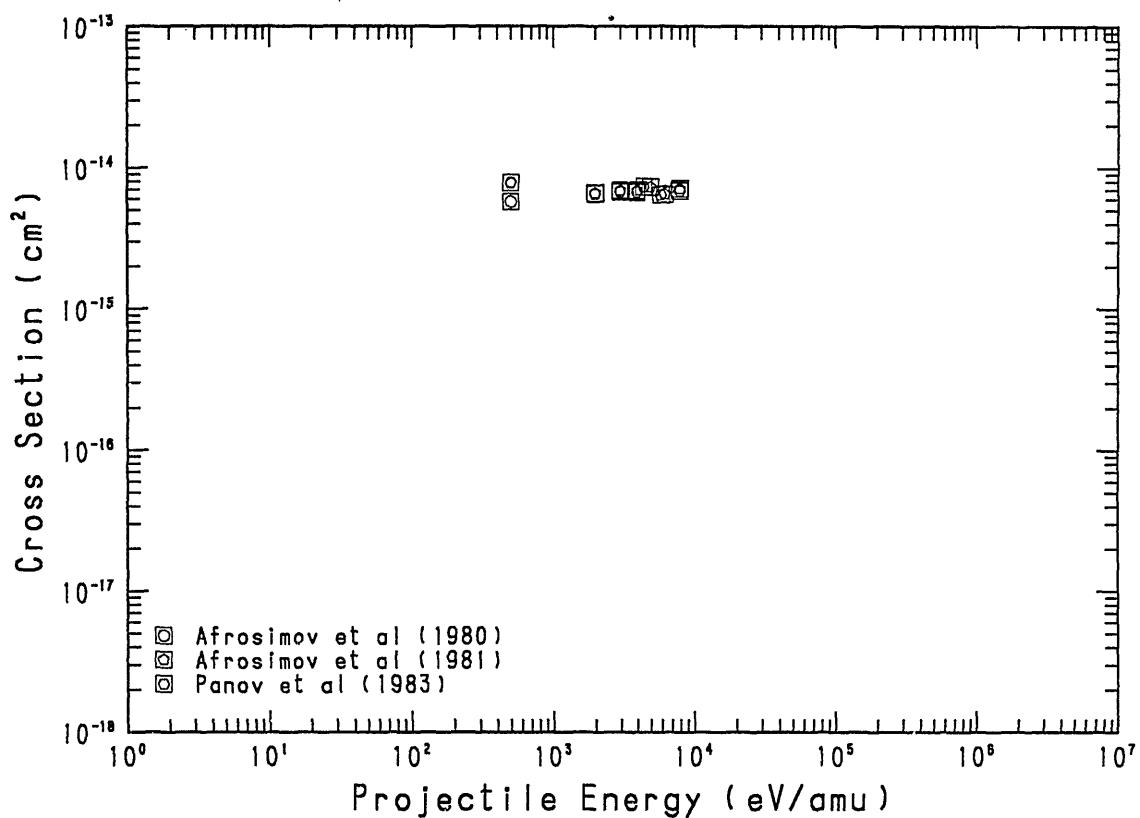


Fig.40 $F^+ + H_2 \rightarrow F$

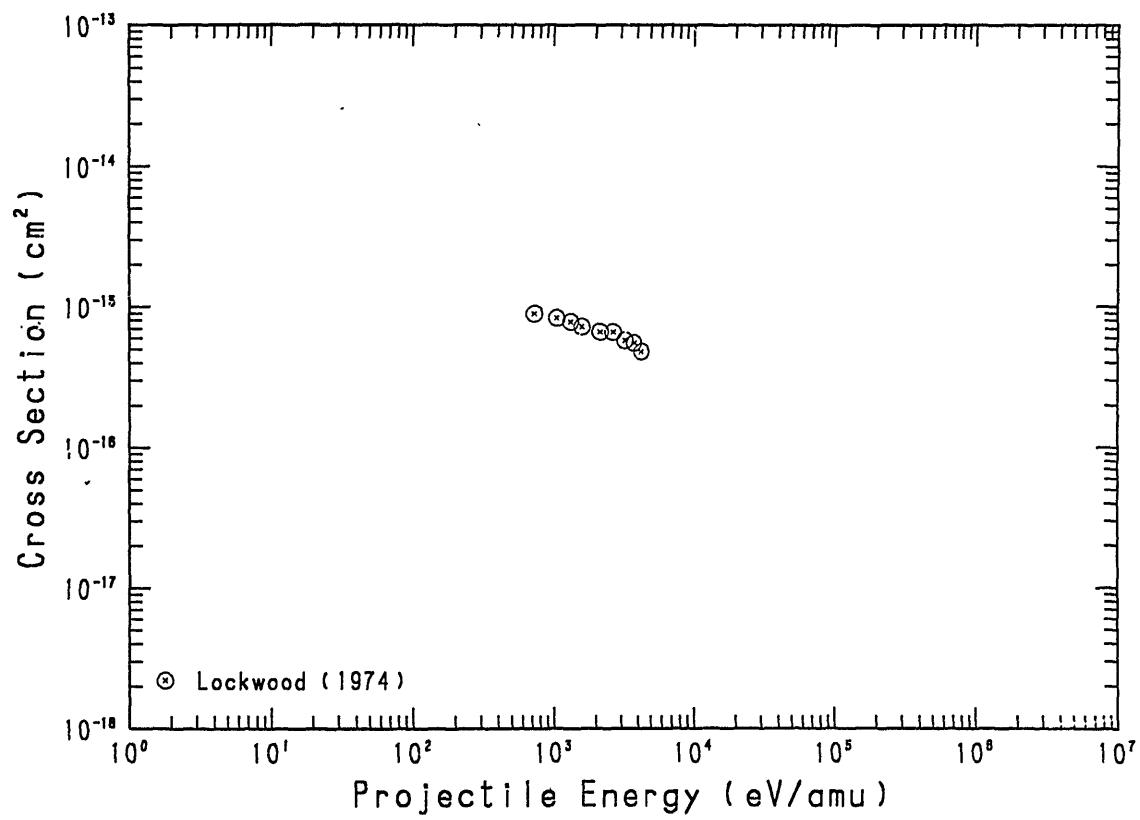


Fig. 41 $F^{9+} + H_2 \rightarrow F^{8+}$

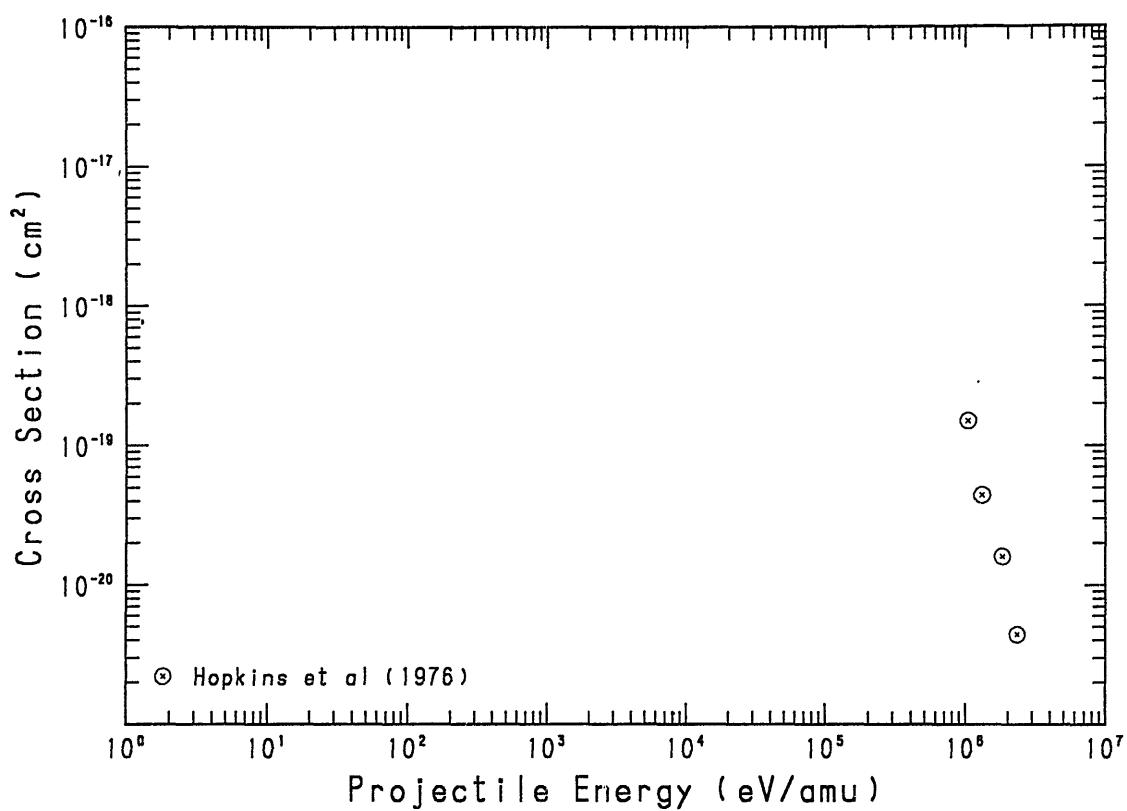


Fig. 42 $Ne^{+*} + H_2 \rightarrow Ne$

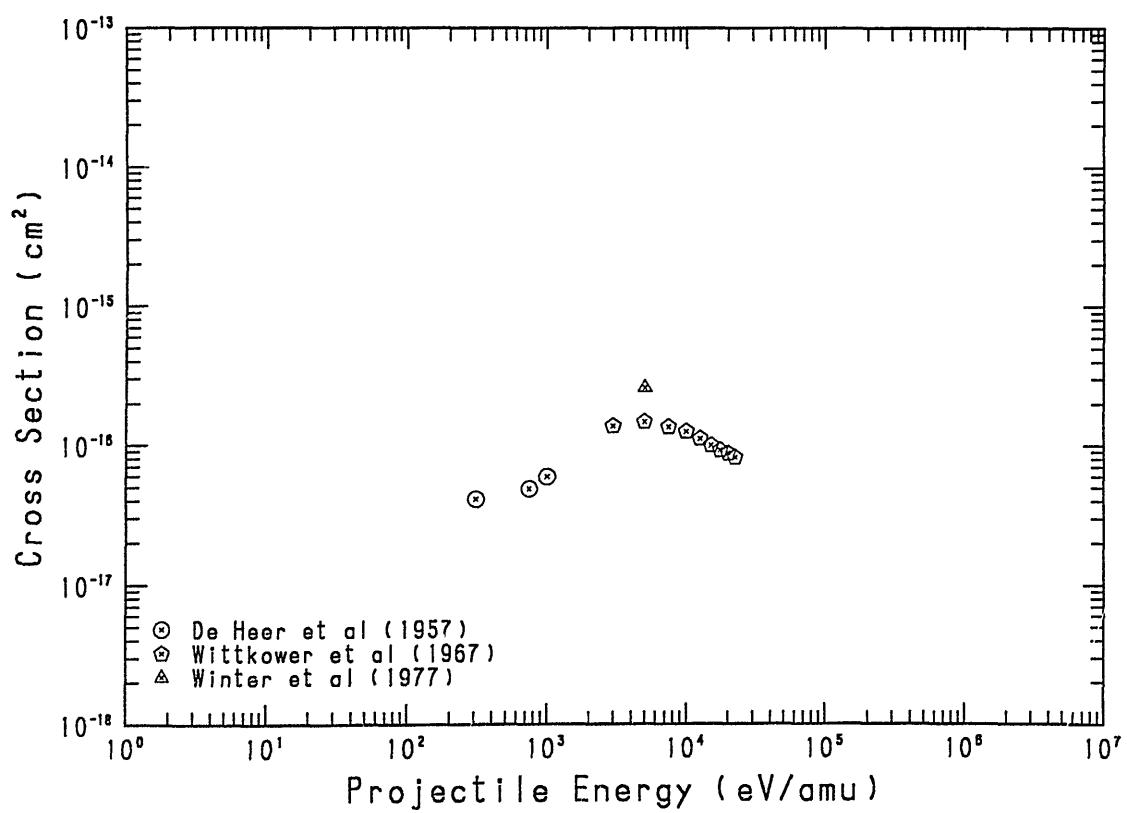


Fig. 43 $\text{Ne}^{2+} + \text{H}_2 \rightarrow \text{Ne}^+$

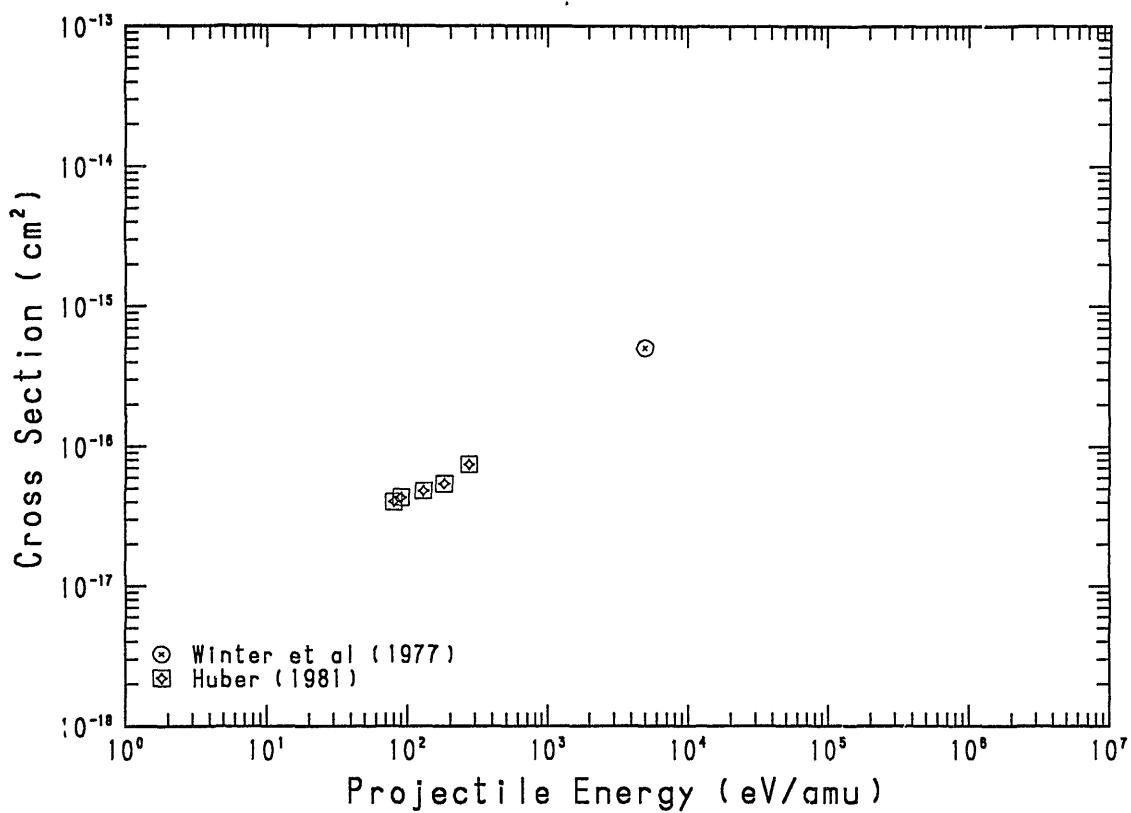


Fig. 44 $\text{Ne}^{3+} + \text{H}_2 \rightarrow \text{Ne}^{2+}$

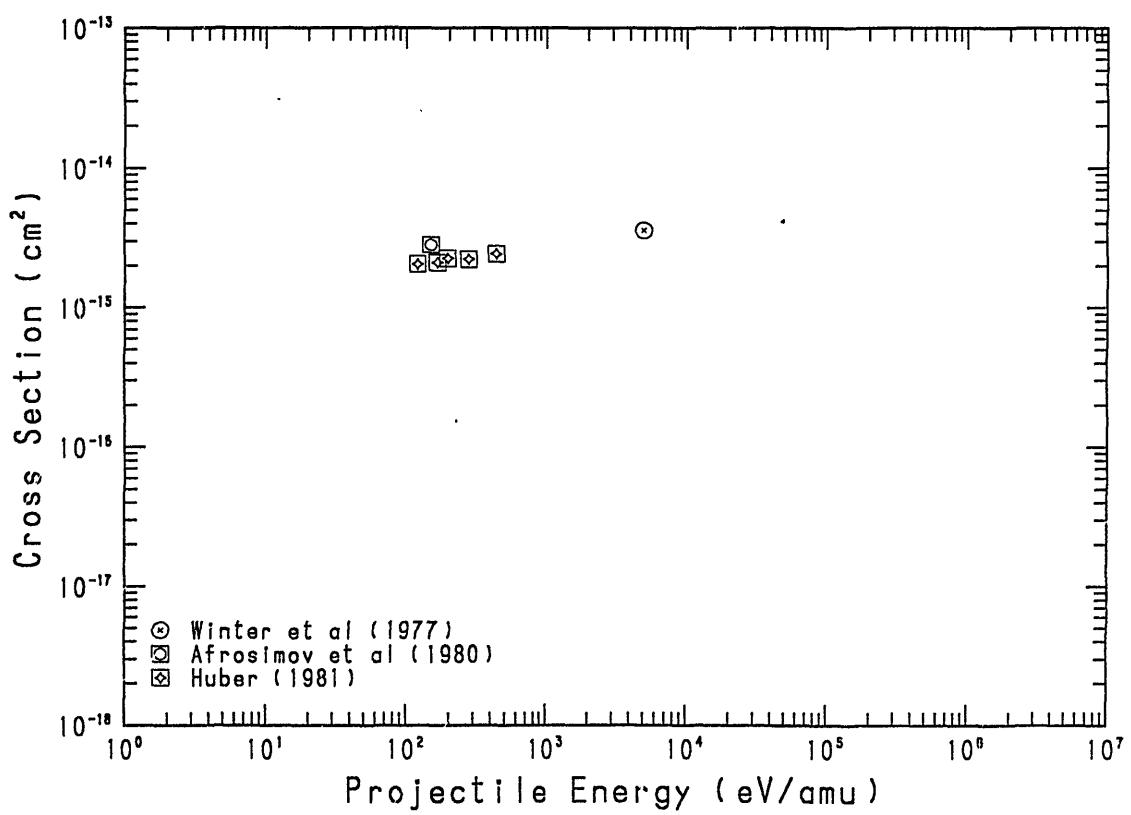


Fig. 45 $\text{Ne}^{4+} + \text{H}_2 \rightarrow \text{Ne}^{3+}$

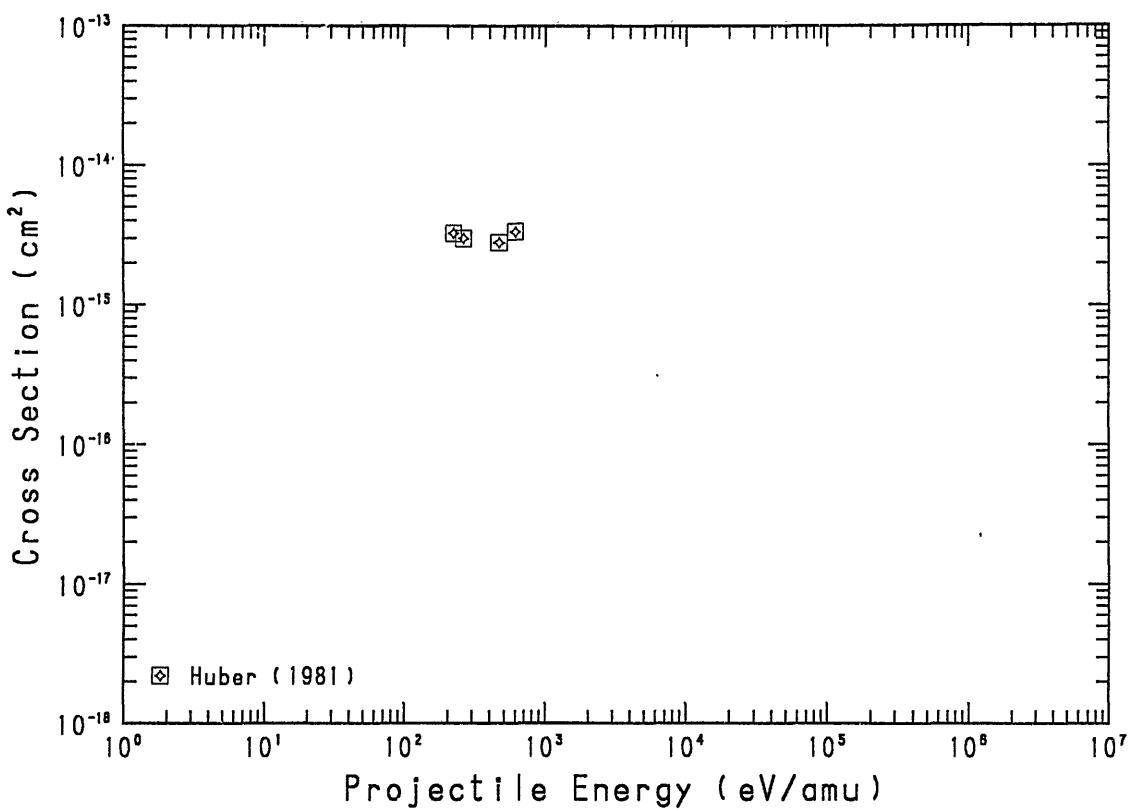


Fig. 46 $\text{Ne}^{6+} + \text{H}_2 \rightarrow \text{Ne}^{5+}$

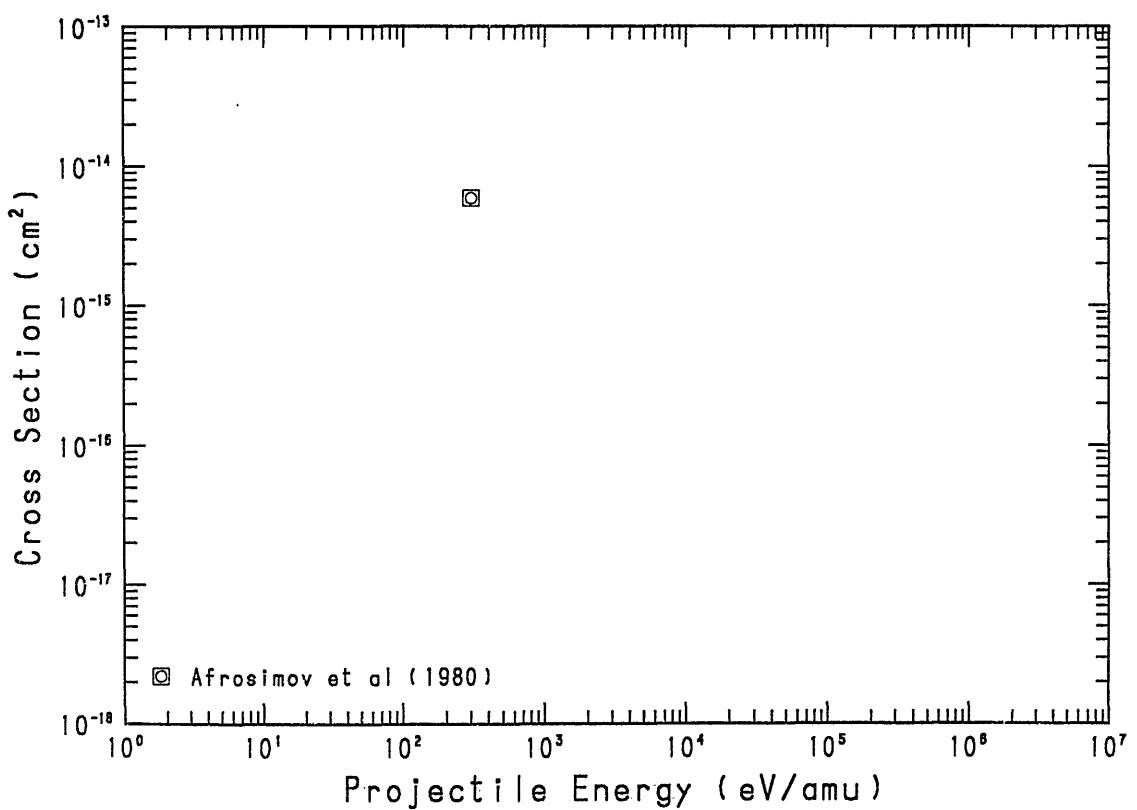


Fig. 47 $\text{Ne}^{8+} + \text{H}_2 \rightarrow \text{Ne}^{7+}$

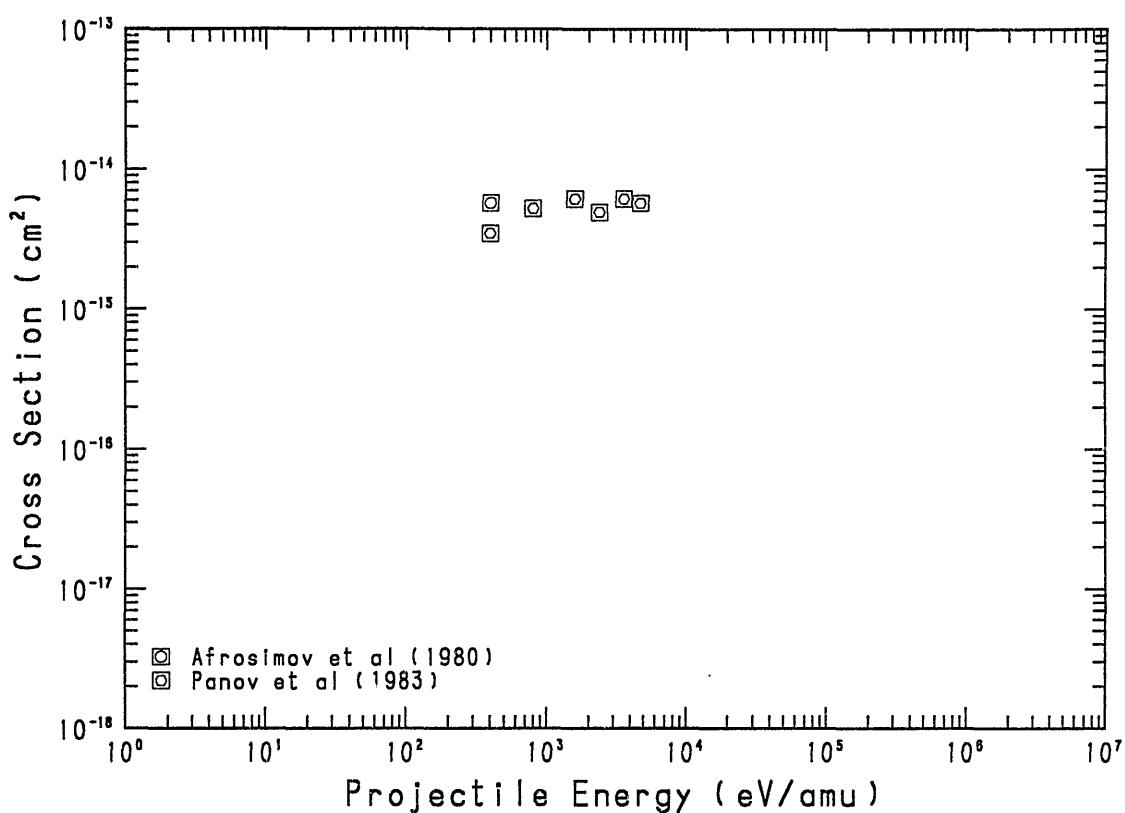


Fig. 48 $\text{Ne}^{9+} + \text{H}_2 \rightarrow \text{Ne}^{8+}$

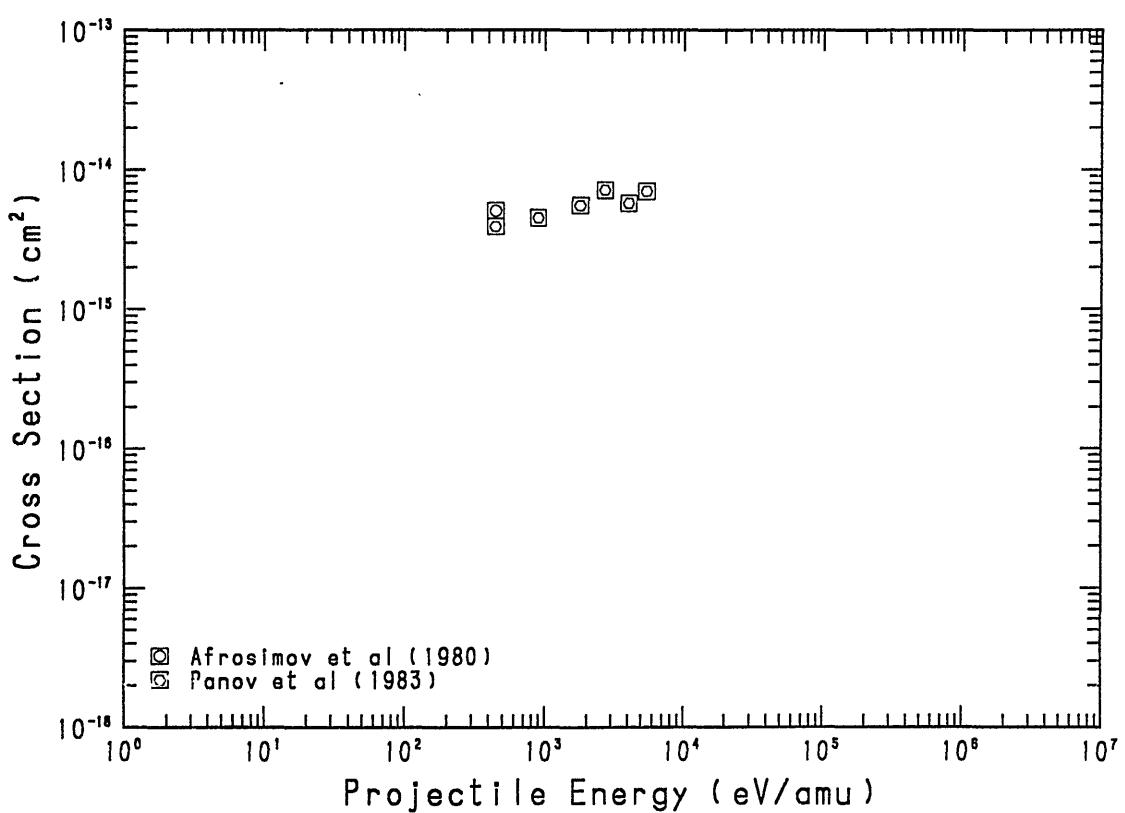


Fig. 49 $\text{Ne}^{10+} + \text{H}_2 \rightarrow \text{Ne}^{9+}$

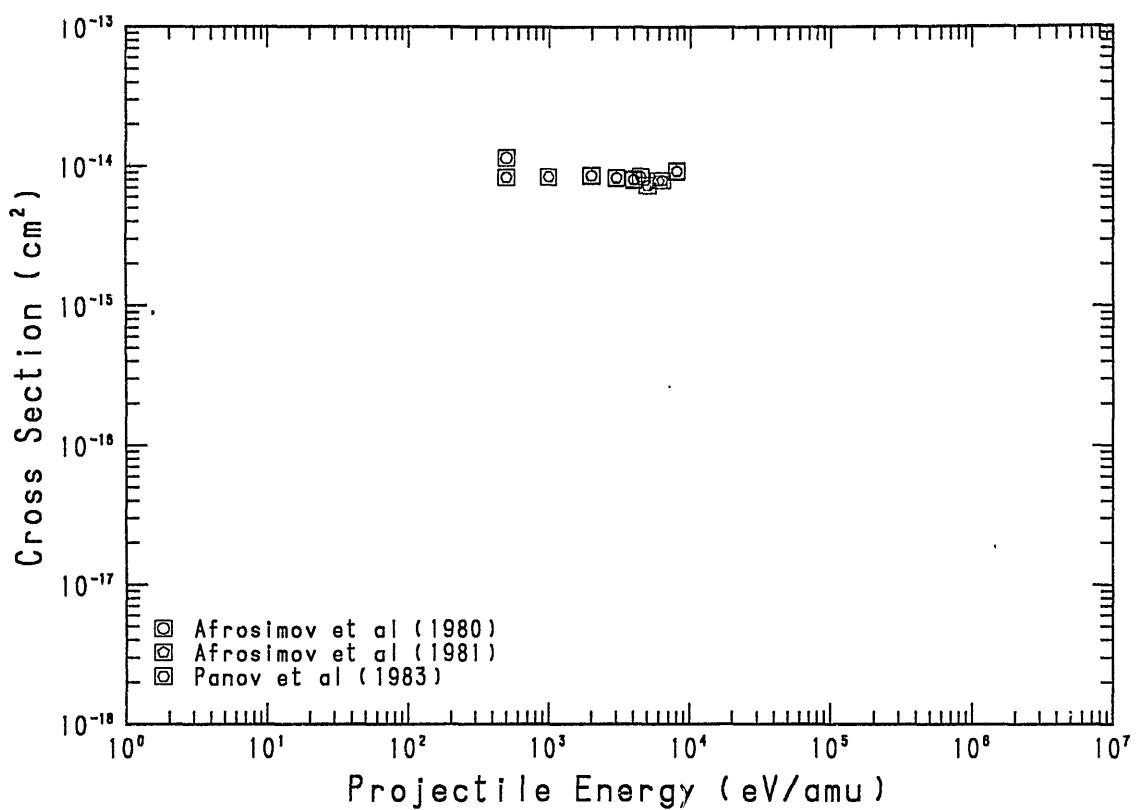


Fig. 50 $\text{Na}^{2+} + \text{H}_2 \rightarrow \text{Na}^+$

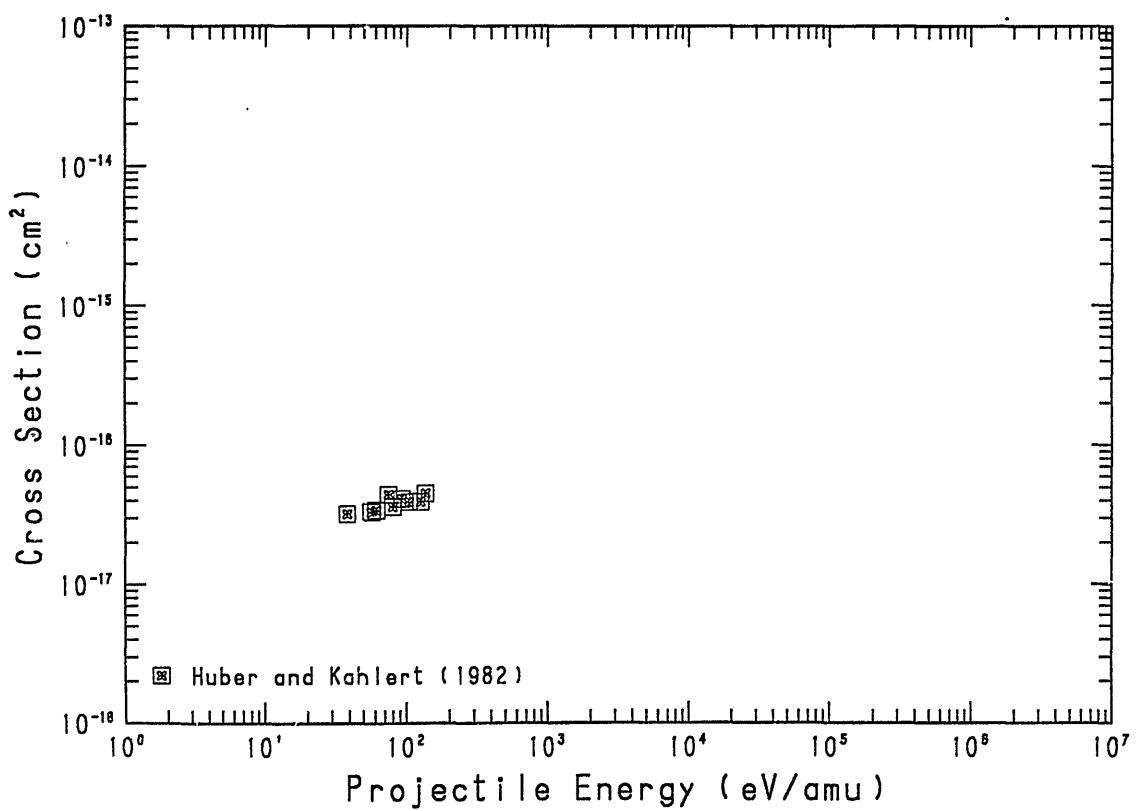


Fig. 51 $\text{Na}^{3+} + \text{H}_2 \rightarrow \text{Na}^{2+}$

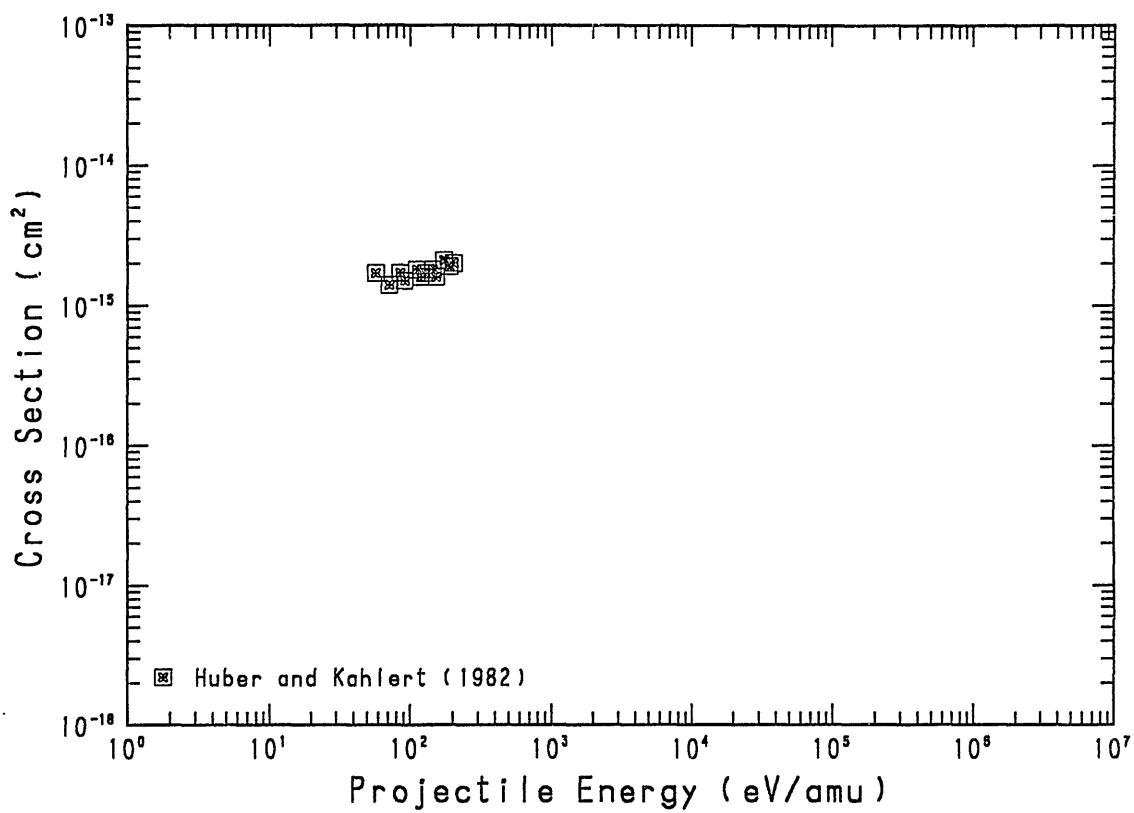


Fig. 52 $\text{Na}^{4+} + \text{H}_2 \rightarrow \text{Na}^{3+}$

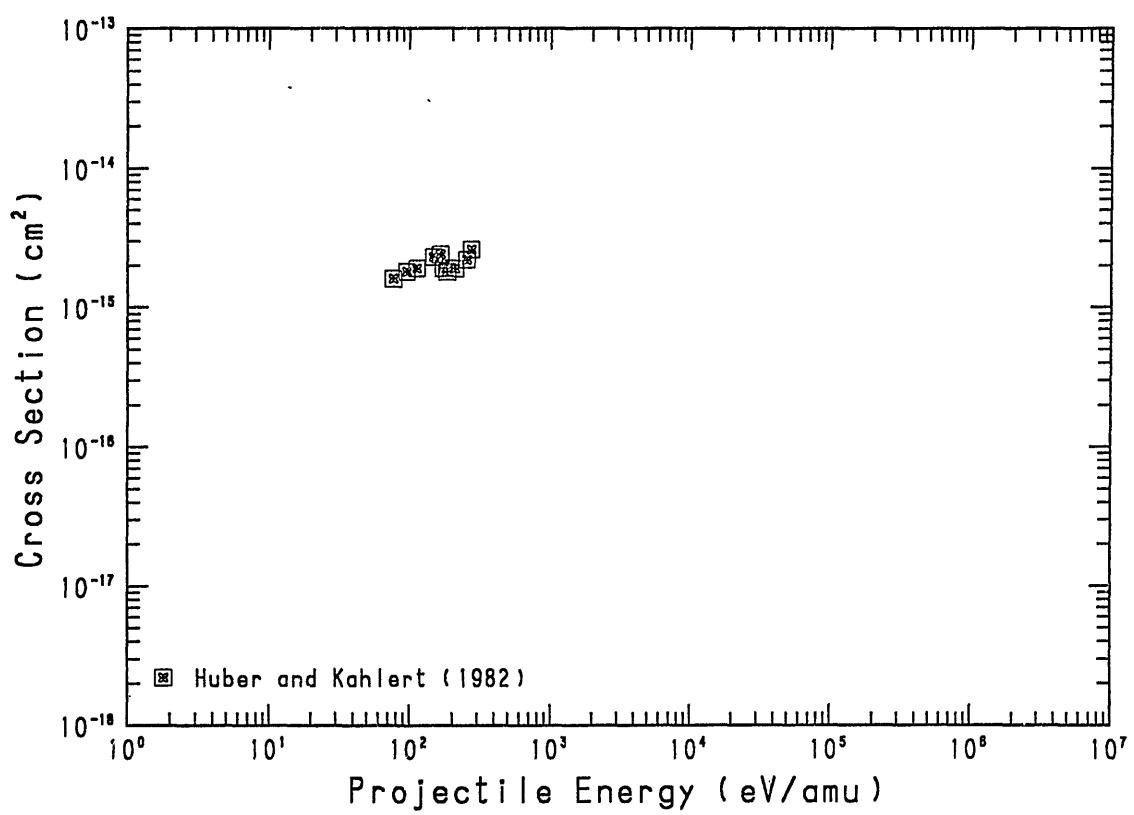


Fig.53 $Mg^{2+} + H_2 \rightarrow Mg^+$

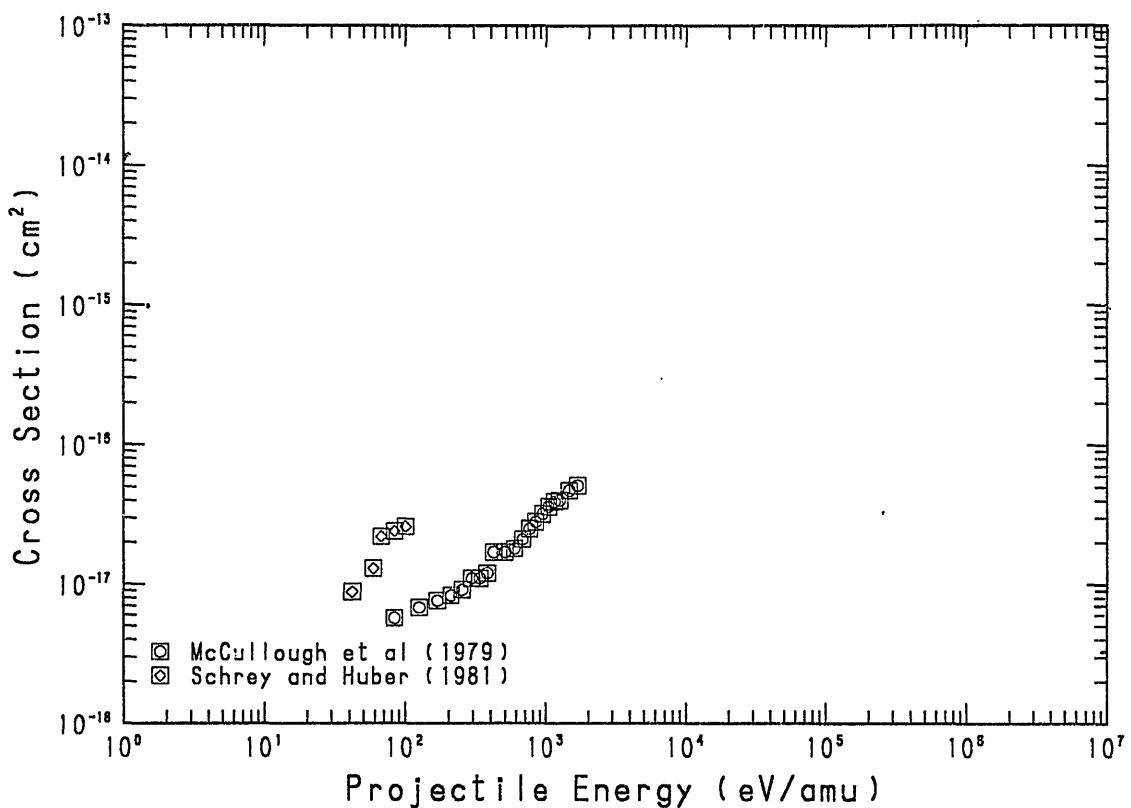


Fig.54 $Mg^{3+} + H_2 \rightarrow Mg^{2+}$

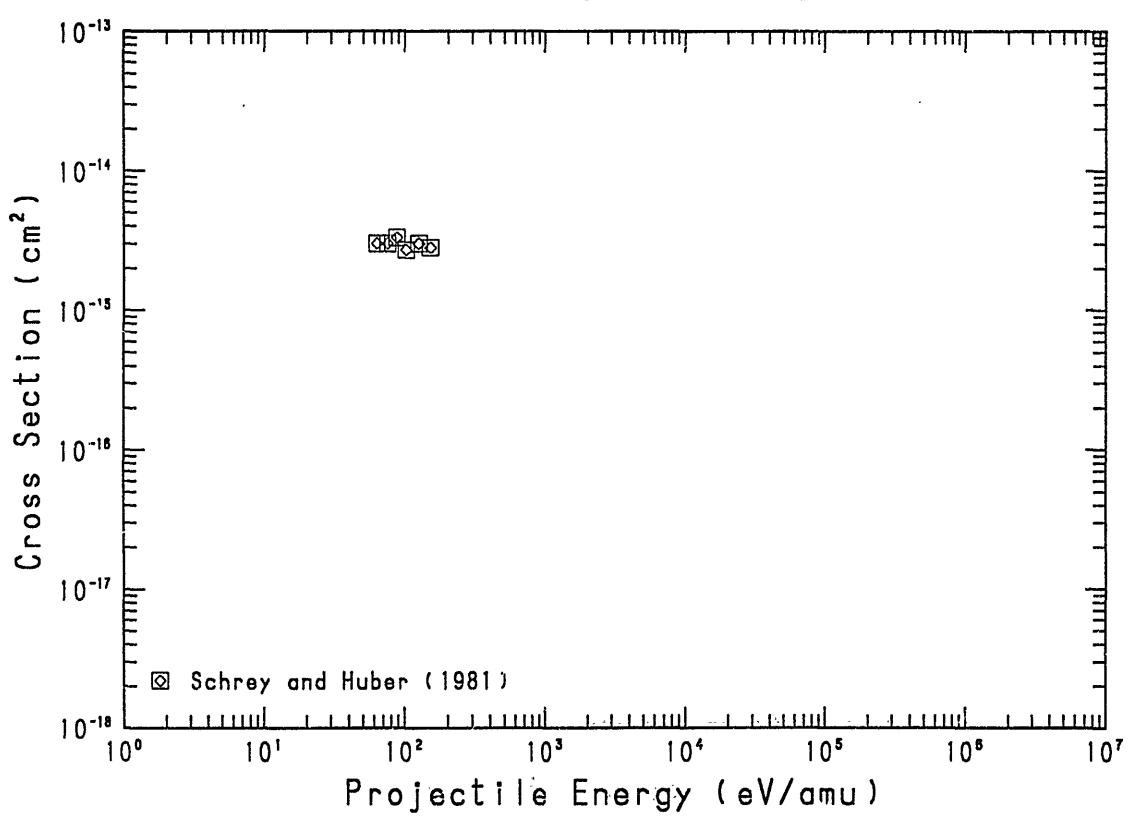


Fig. 55 $Mg^{3+} + H_2 \rightarrow Mg^+$

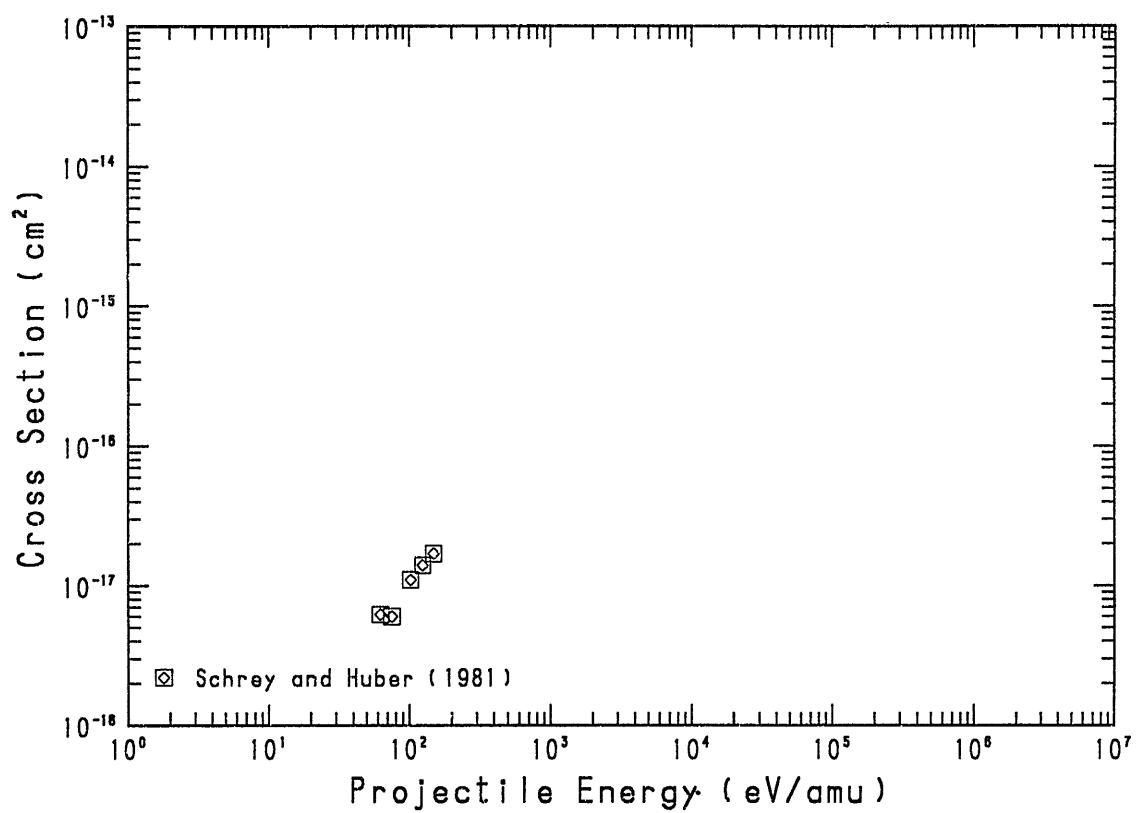


Fig. 56 $Mg^{4+} + H_2 \rightarrow Mg^{3+}$

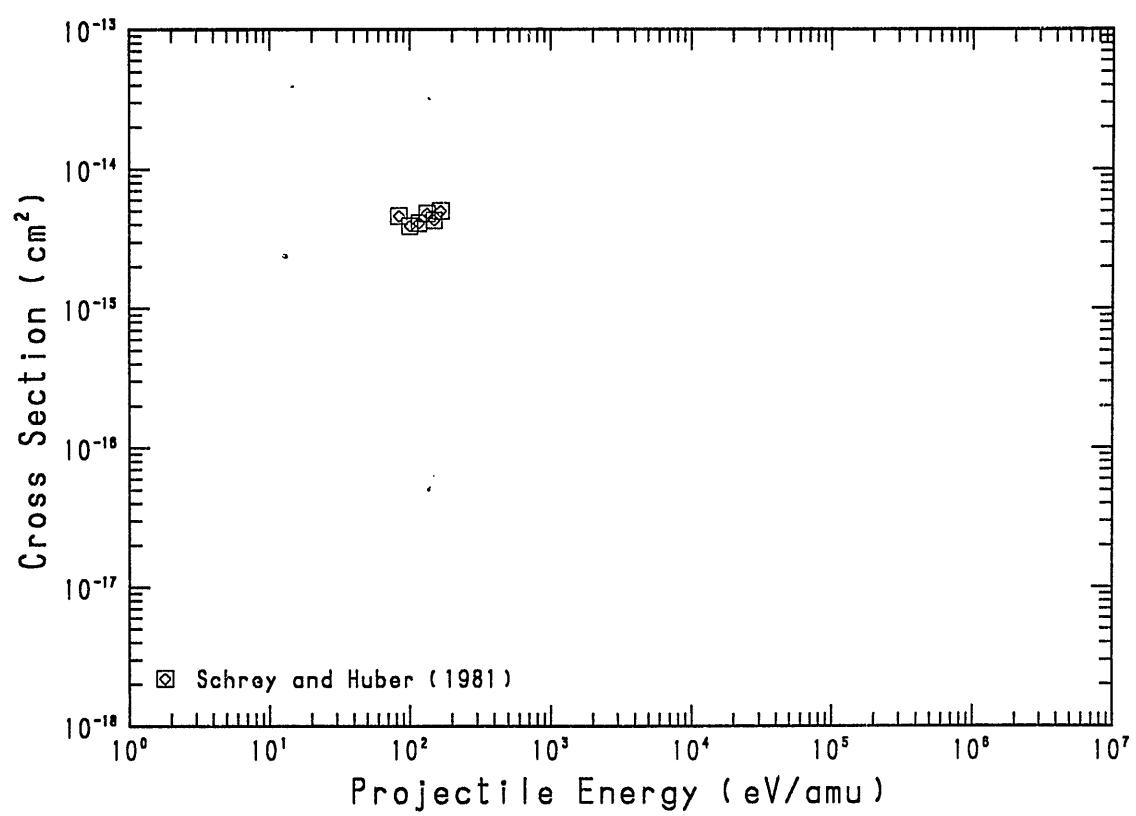


Fig. 57 $Mg^{4+} + H_2 \rightarrow Mg^{2+}$

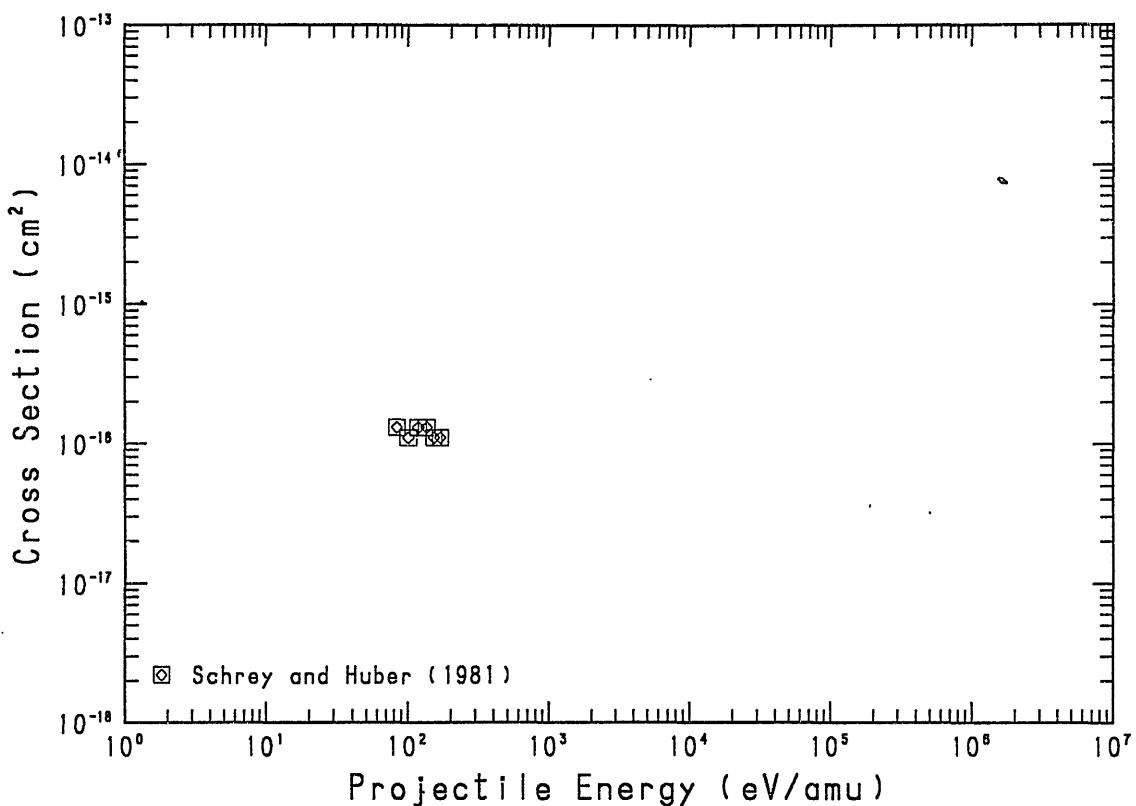


Fig. 58 $Mg^{5+} + H_2 \rightarrow Mg^{4+}$

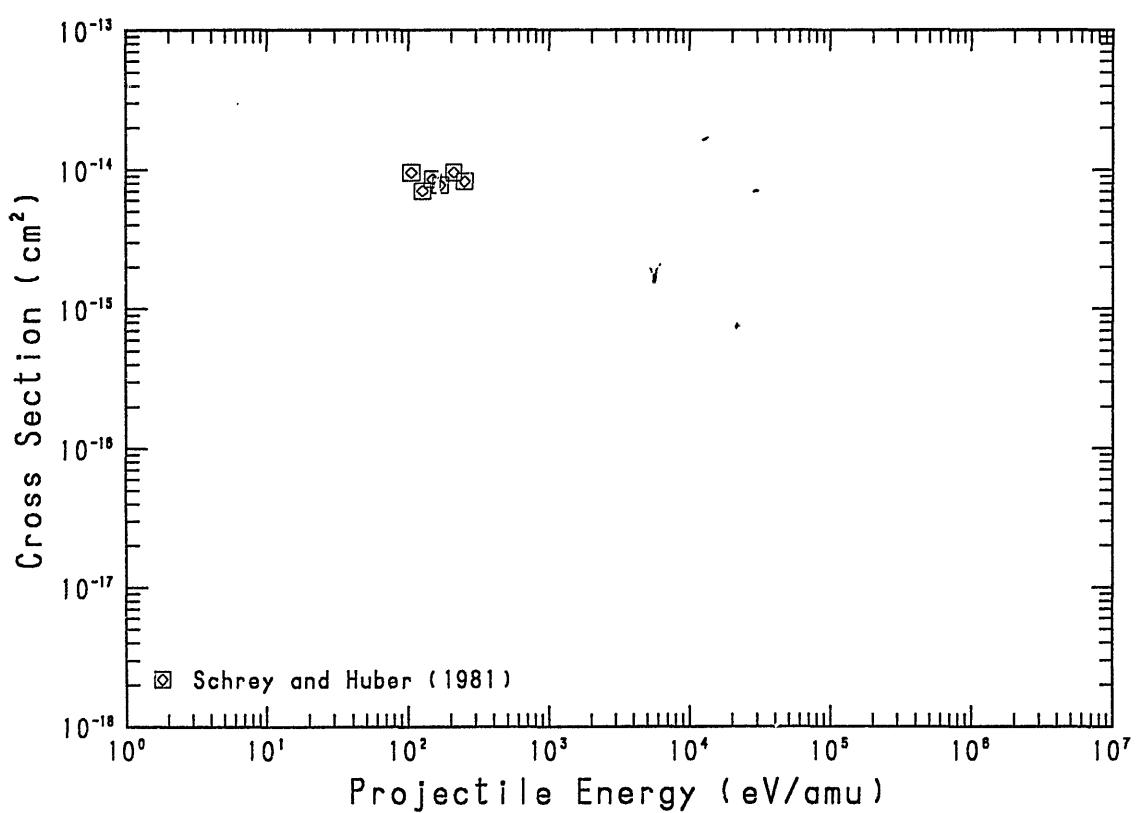


Fig. 59 $\cdot \text{Mg}^{5+} + \text{H}_2 \rightarrow \text{Mg}^{3+}$

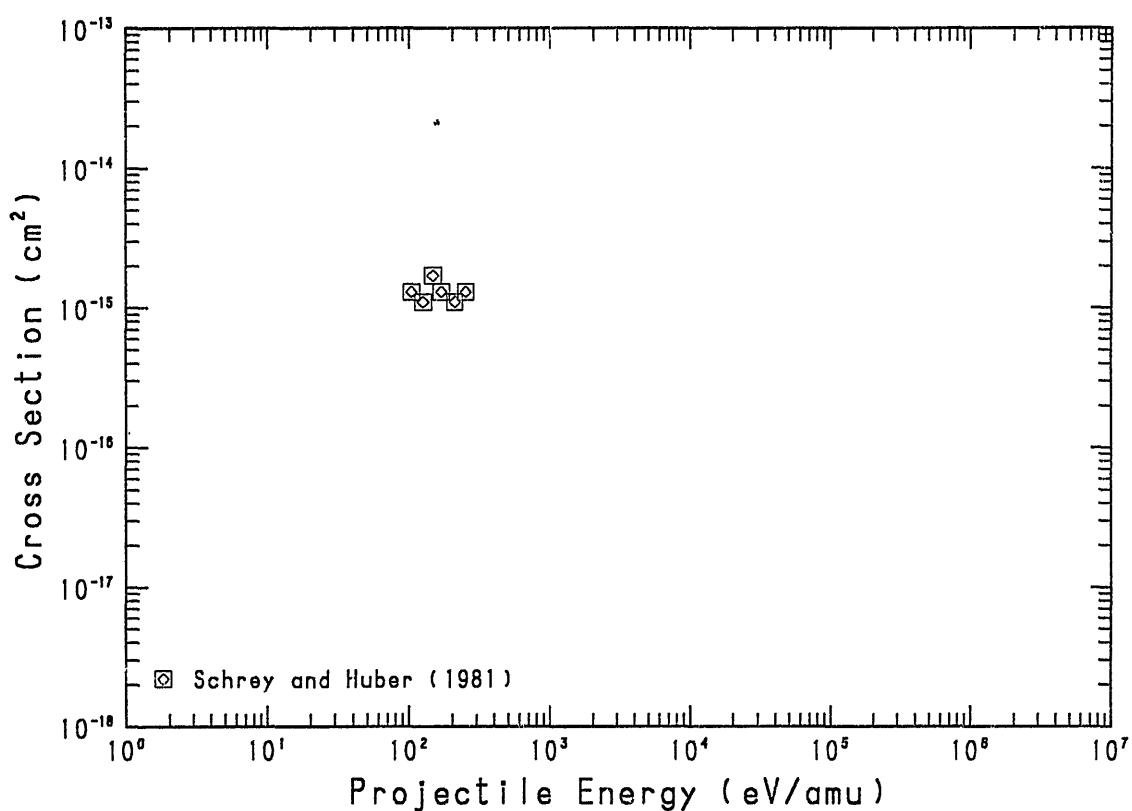


Fig. 60 $\text{Al}^{2+} + \text{H}_2 \rightarrow \text{Al}^{+}$

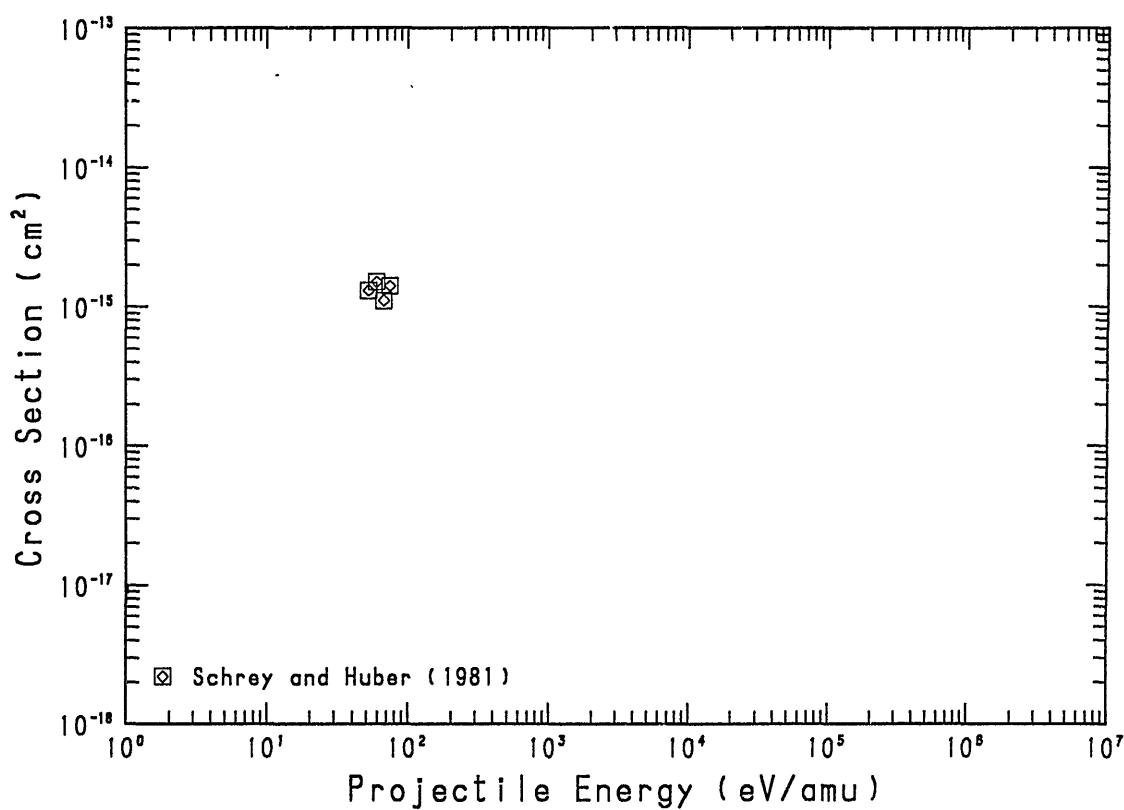


Fig. 61 $\text{Al}^{3+} + \text{H}_2 \rightarrow \text{Al}^{2+}$

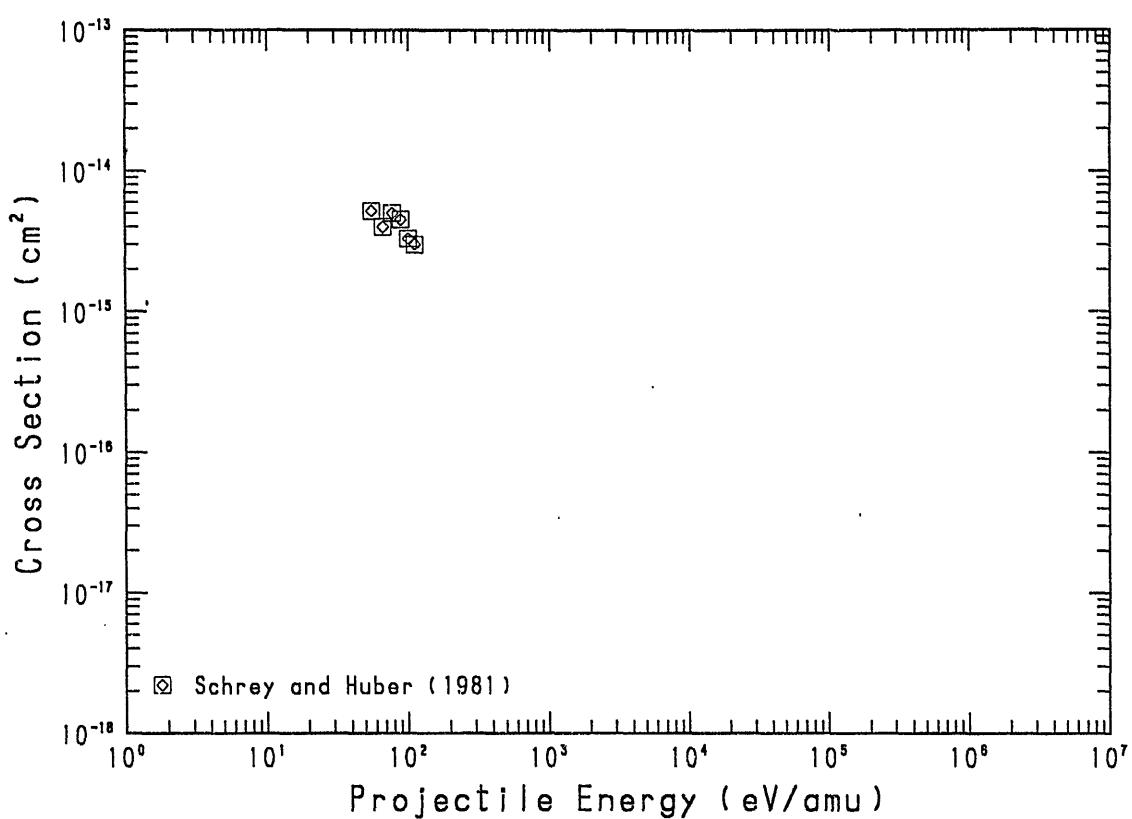


Fig. 62 $\text{Al}^{3+} + \text{H}_2 \rightarrow \text{Al}^{+}$

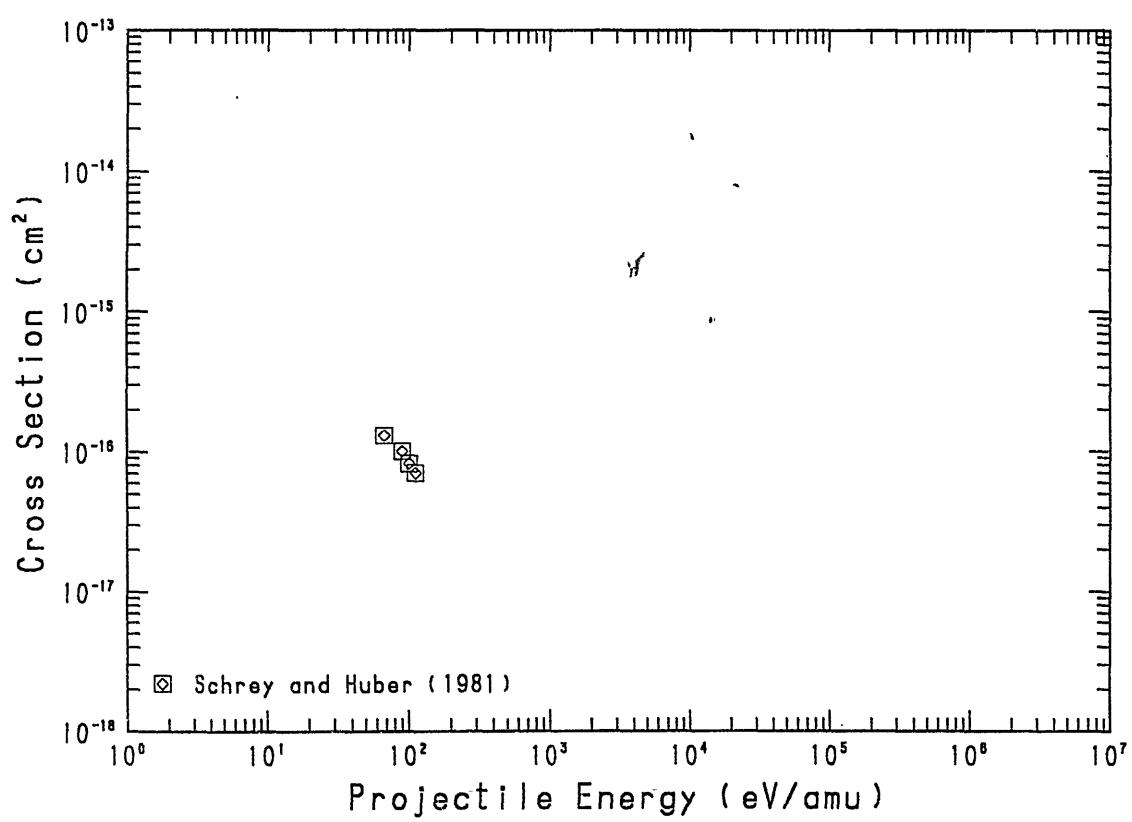


Fig. 63 $\text{Al}^{4+} + \text{H}_2 \rightarrow \text{Al}^{3+}$

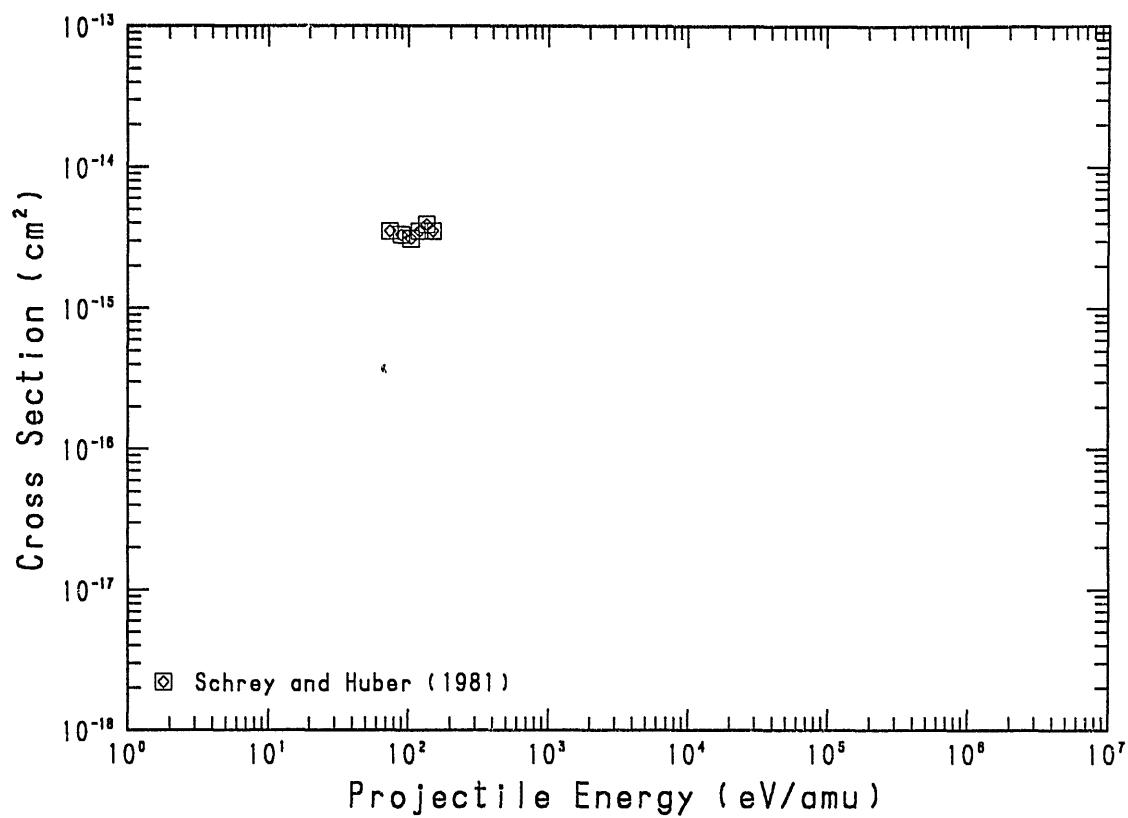


Fig. 64 $\text{Al}^{4+} + \text{H}_2 \rightarrow \text{Al}^{2+}$

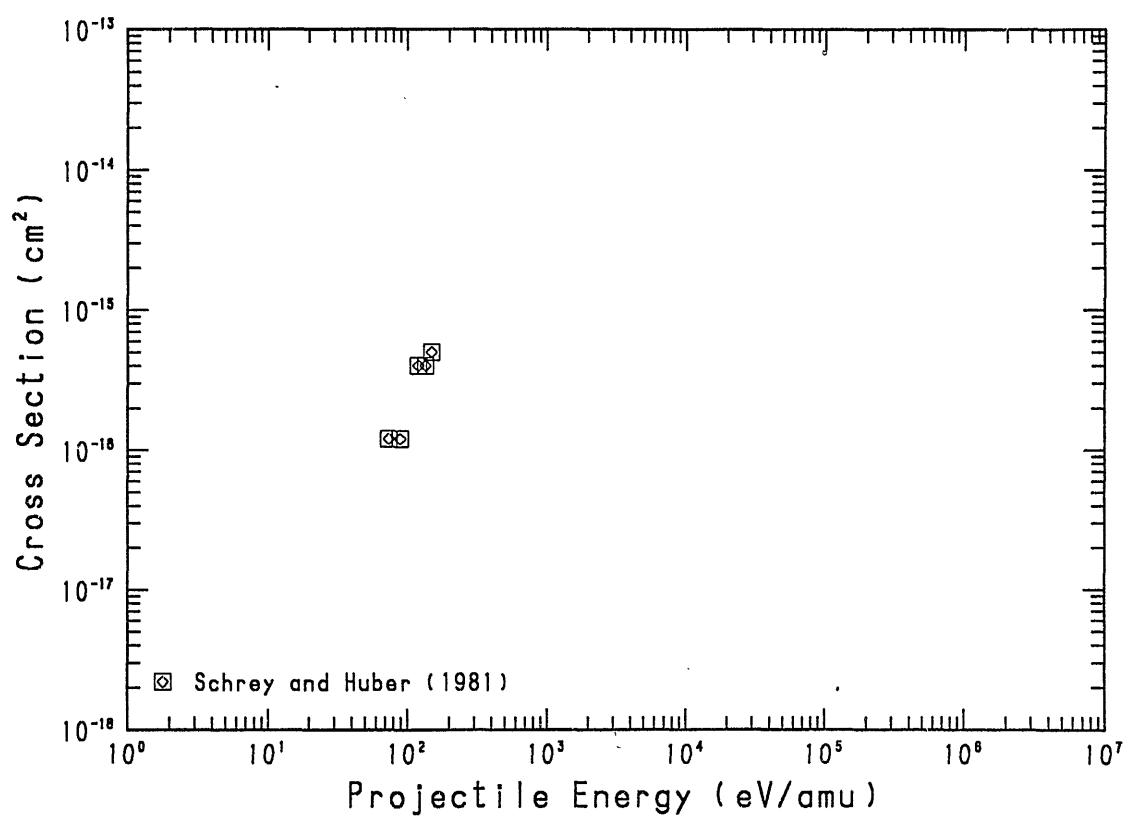


Fig. 65 $\text{Al}^{5+} + \text{H}_2 \rightarrow \text{Al}^{4+}$

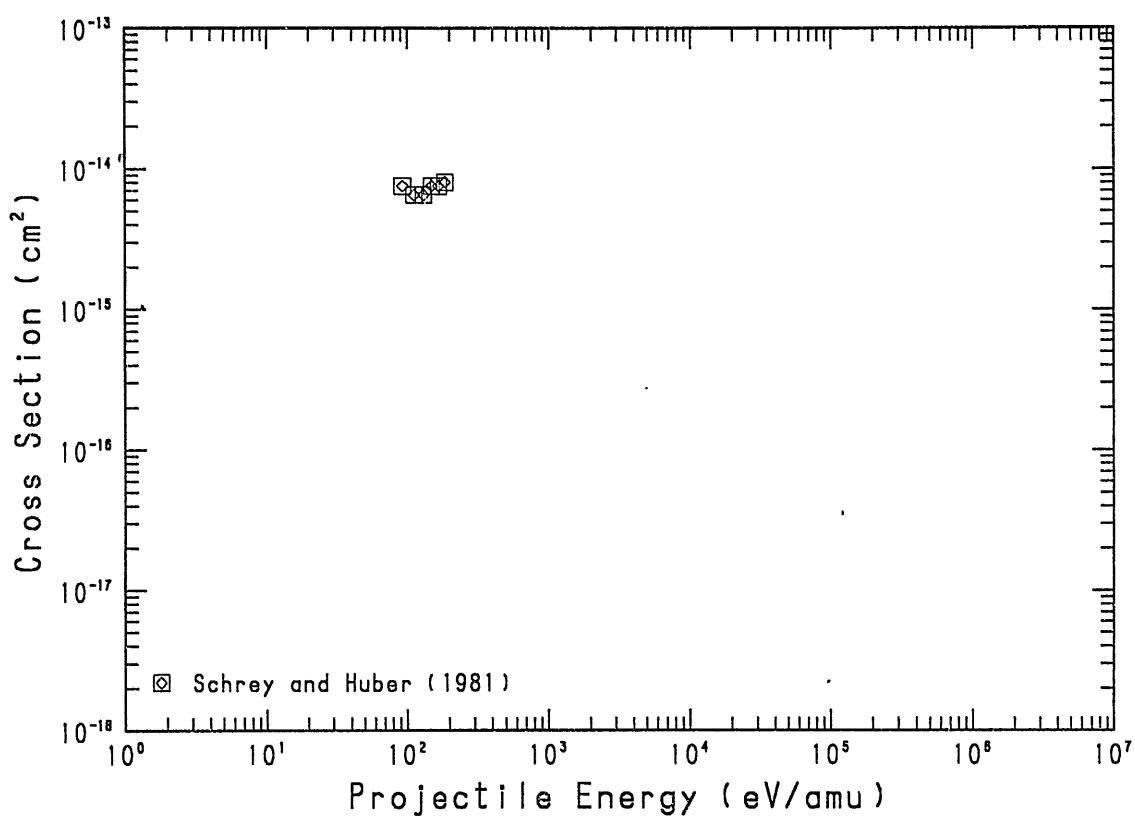


Fig. 66 $\text{Si}^{2+} + \text{H}_2 \rightarrow \text{Si}^{1+}$

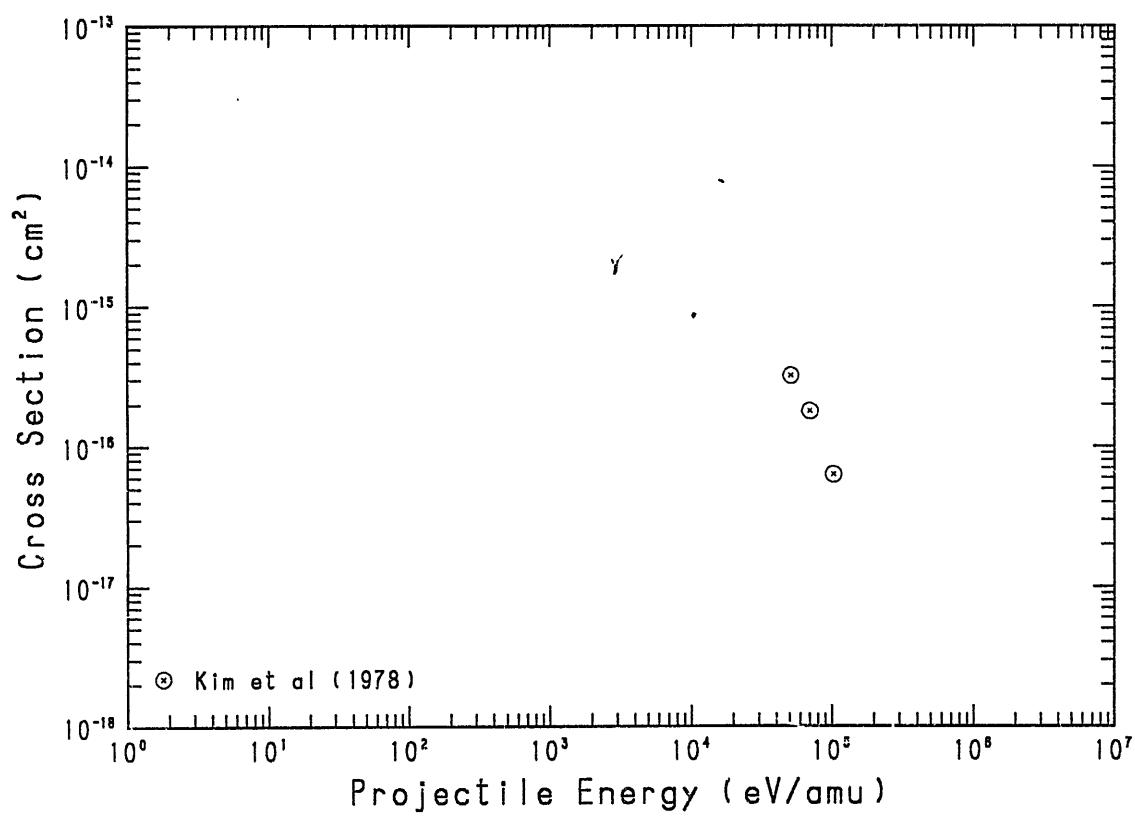


Fig. 67 $\text{Si}^{3+} + \text{H}_2 \rightarrow \text{Si}^{2+}$

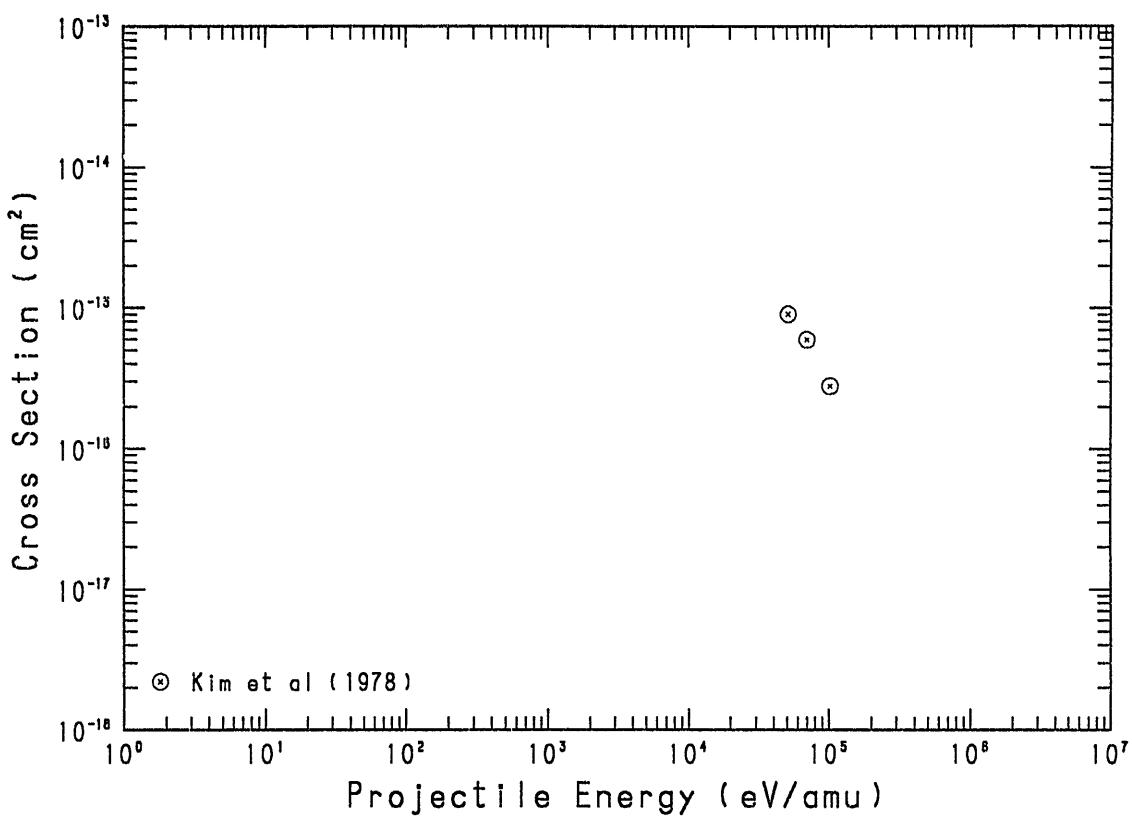


Fig. 68 $\text{Si}^{4+} + \text{H}_2 \rightarrow \text{Si}^{3+}$

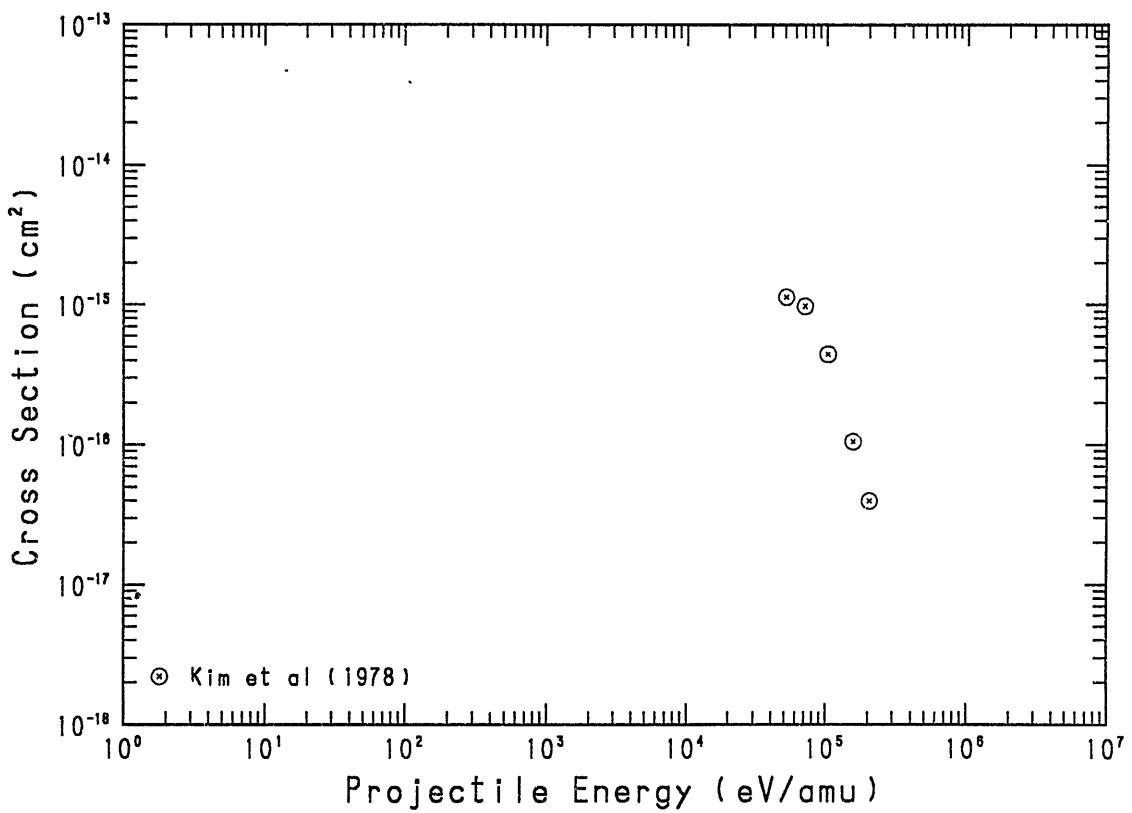


Fig. 69 $\text{Si}^{5+} + \text{H}_2 \rightarrow \text{Si}^{4+}$

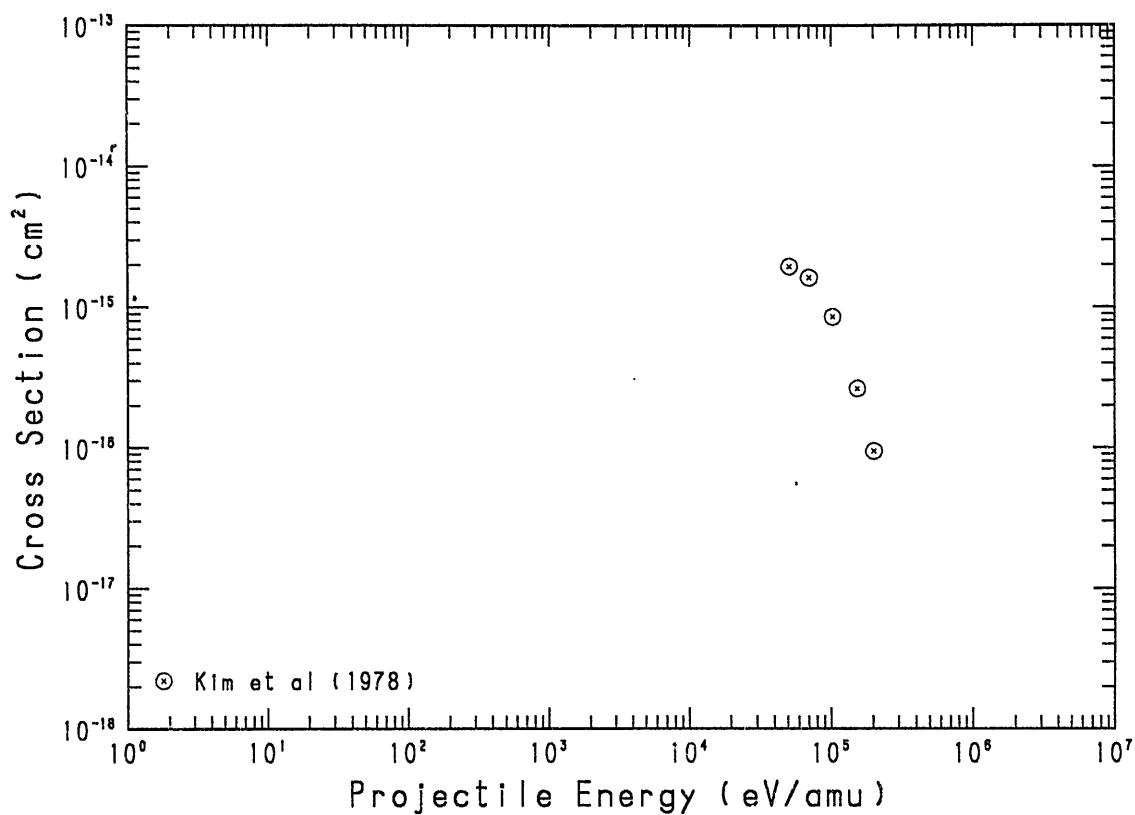


Fig. 70 $\text{Si}^{6+} + \text{H}_2 \rightarrow \text{Si}^{5+}$

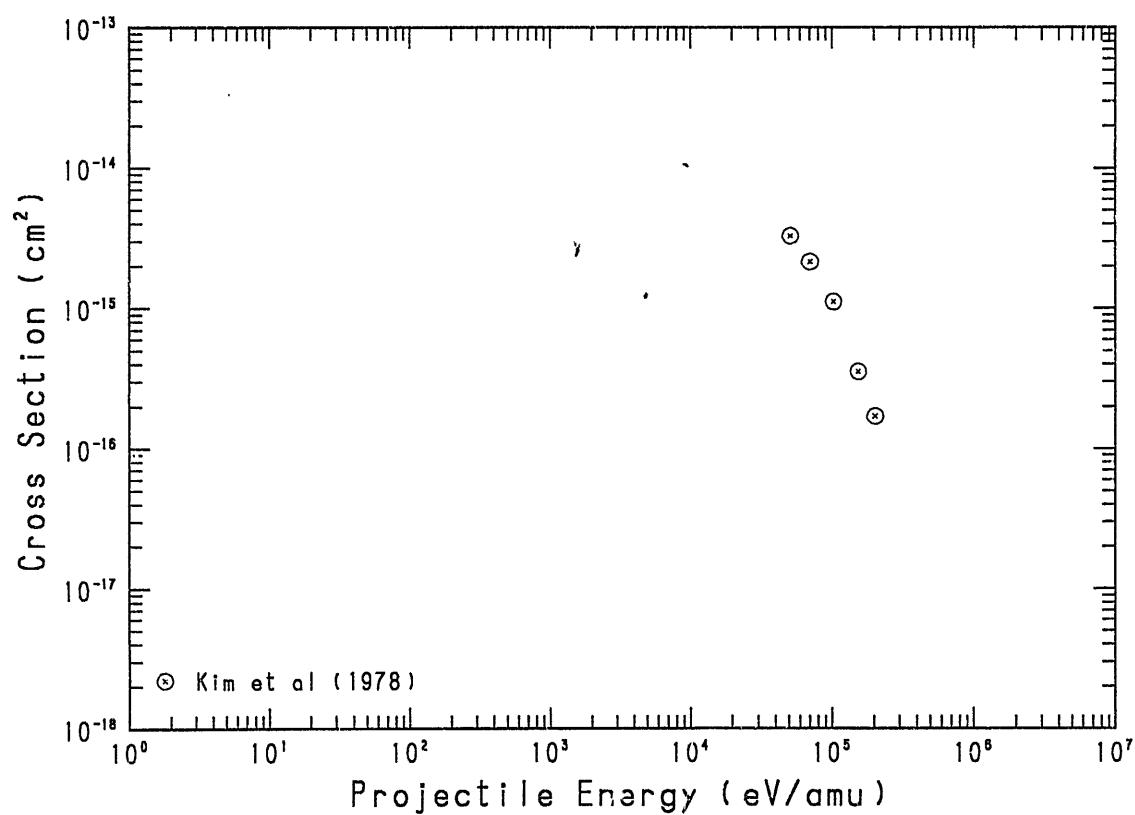


Fig.71 $\text{Si}^{7+} + \text{H}_2 \rightarrow \text{Si}^{6+}$

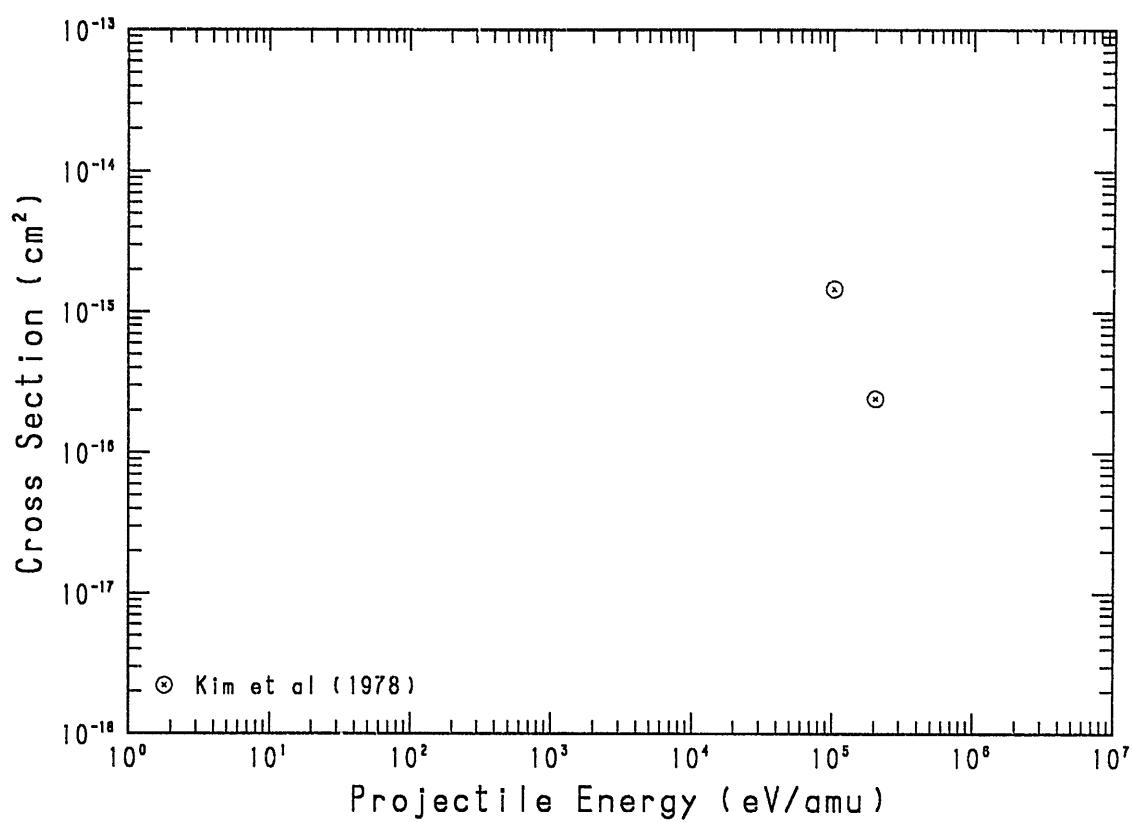


Fig.72 $\text{Si}^{8+} + \text{H}_2 \rightarrow \text{Si}^{7+}$

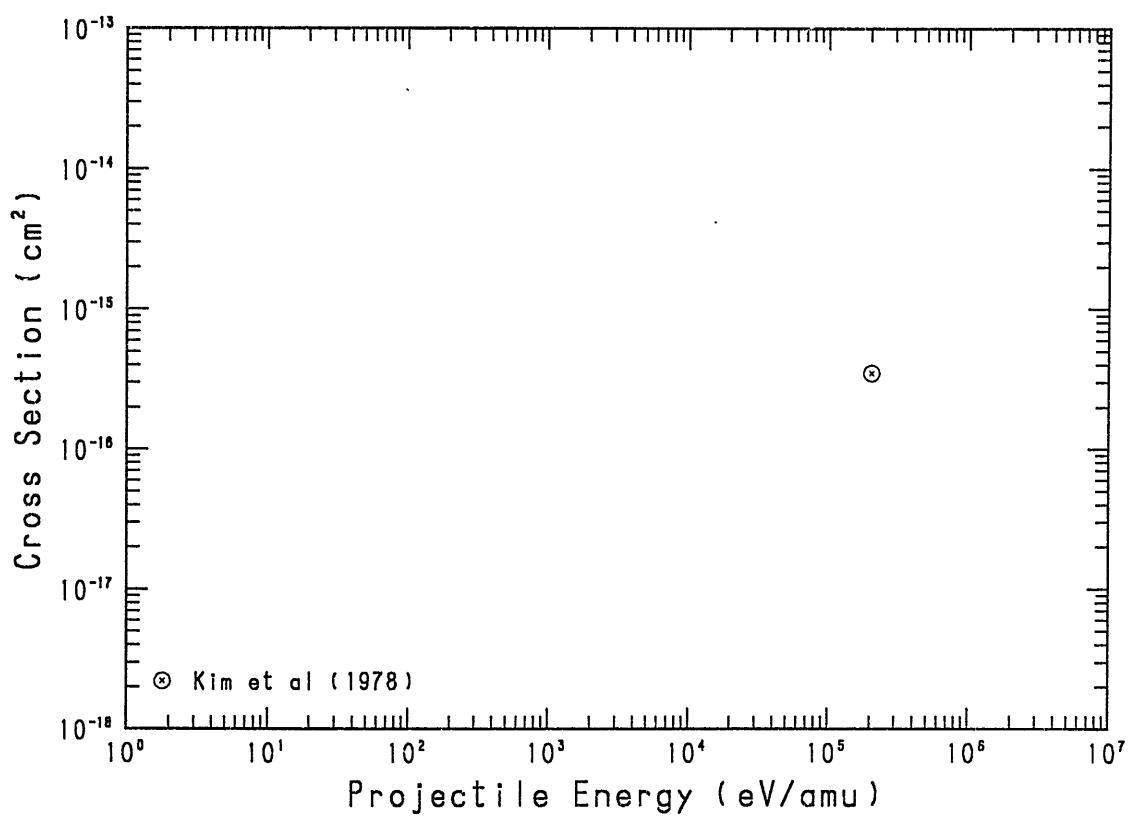


Fig.73 $\text{Si}^{9+} + \text{H}_2 \rightarrow \text{Si}^{8+}$

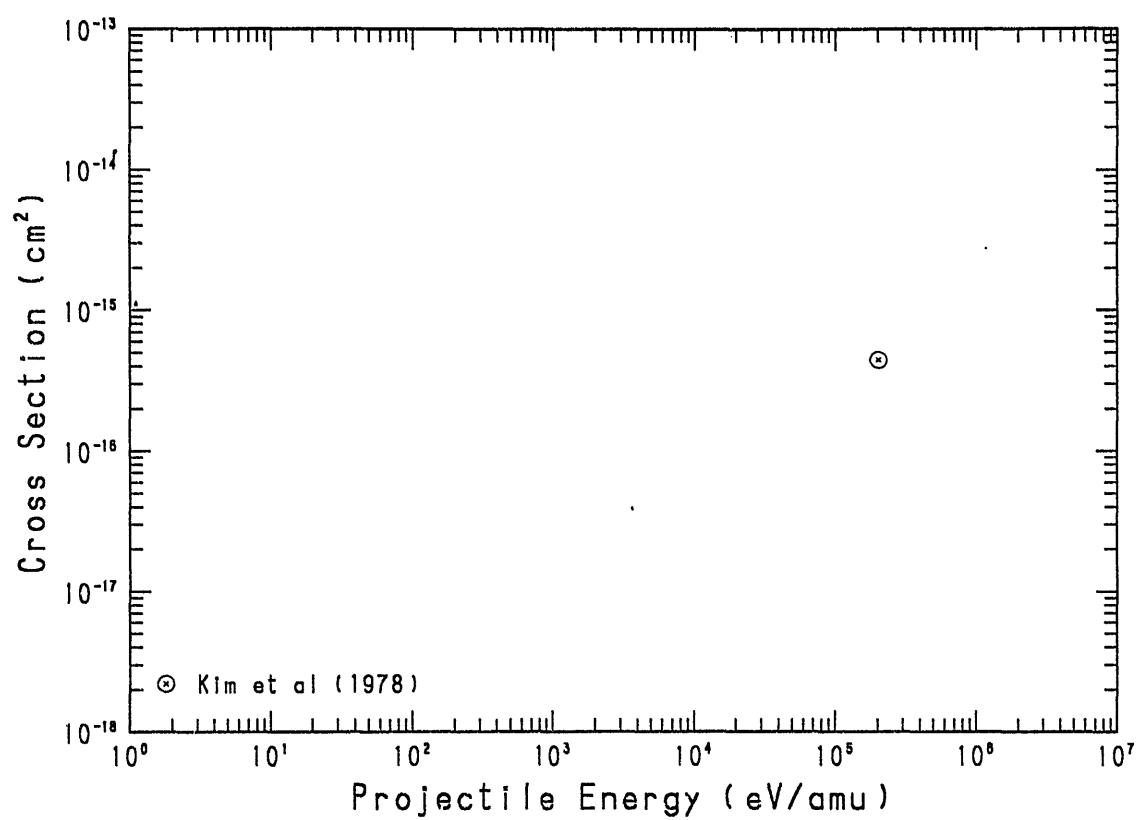


Fig.74 $\text{Si}^{11+} + \text{H}_2 \rightarrow \text{Si}^{10+}$

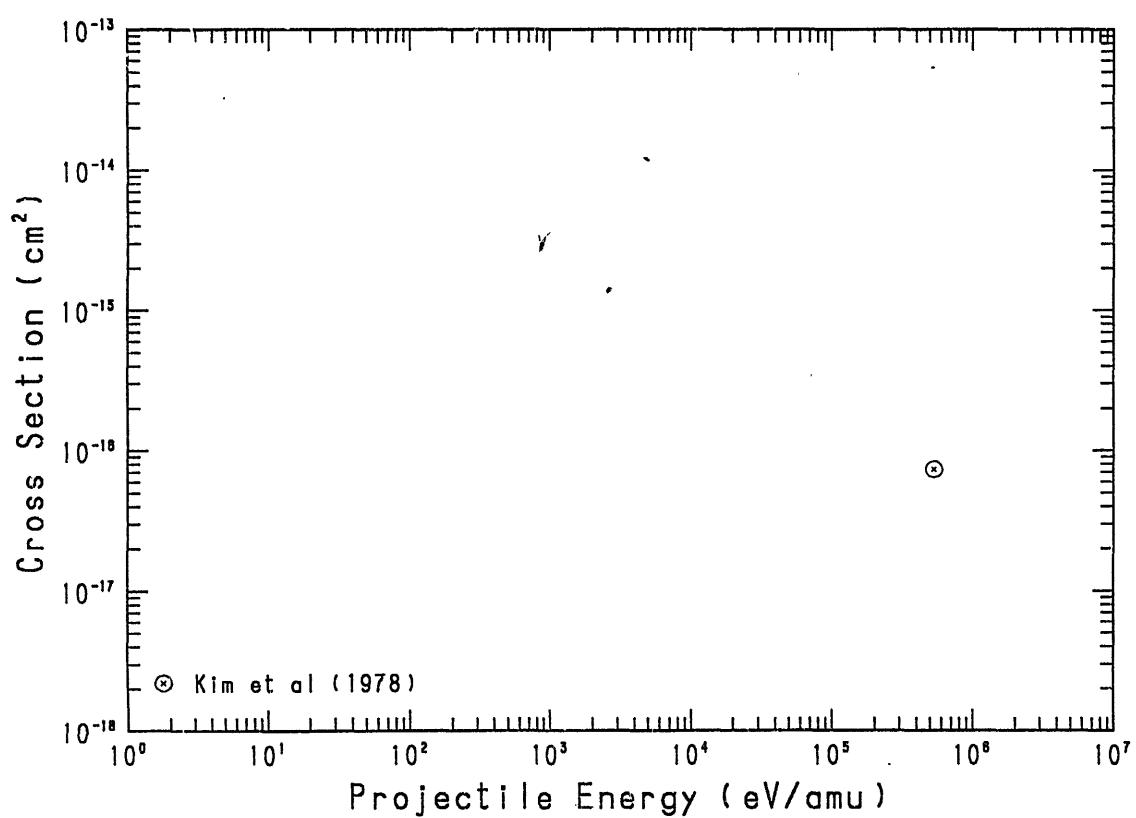


Fig. 75 $\text{Cl}^{3+} + \text{H}_2 \rightarrow \text{Cl}^{2+}$

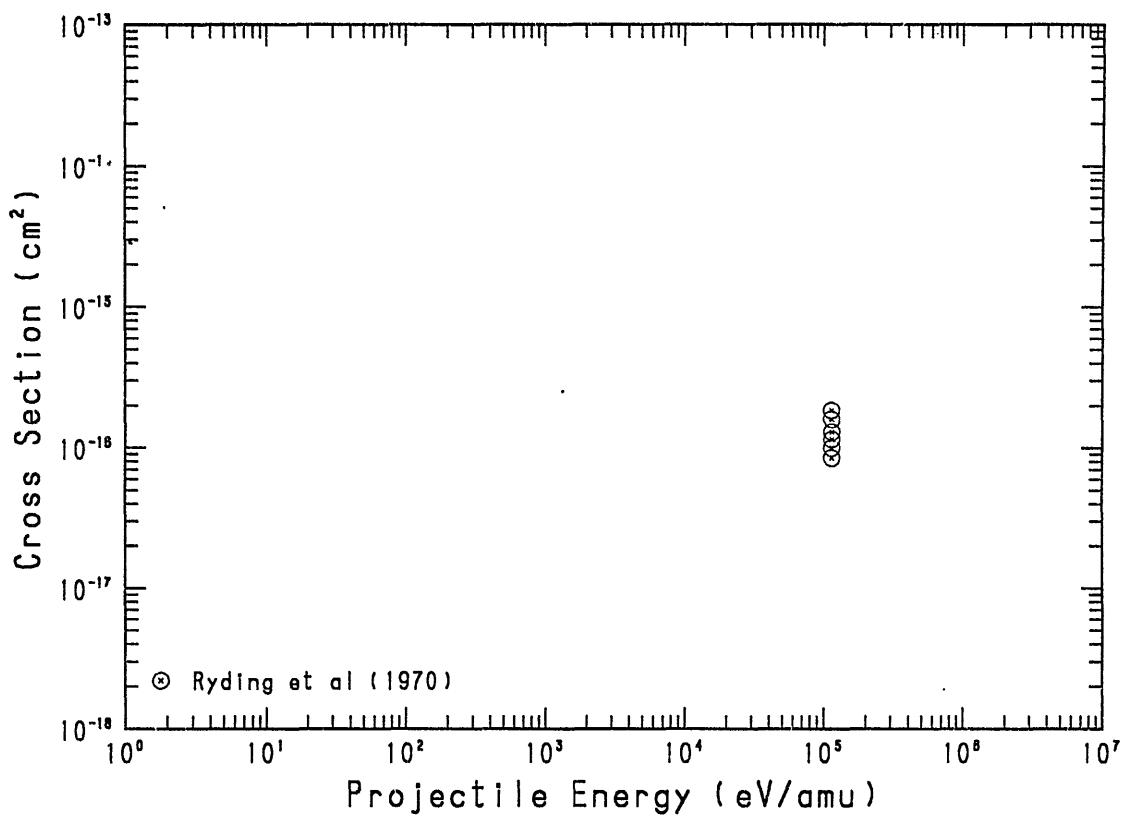


Fig. 76 $\text{Cl}^{4+} + \text{H}_2 \rightarrow \text{Cl}^{3+}$

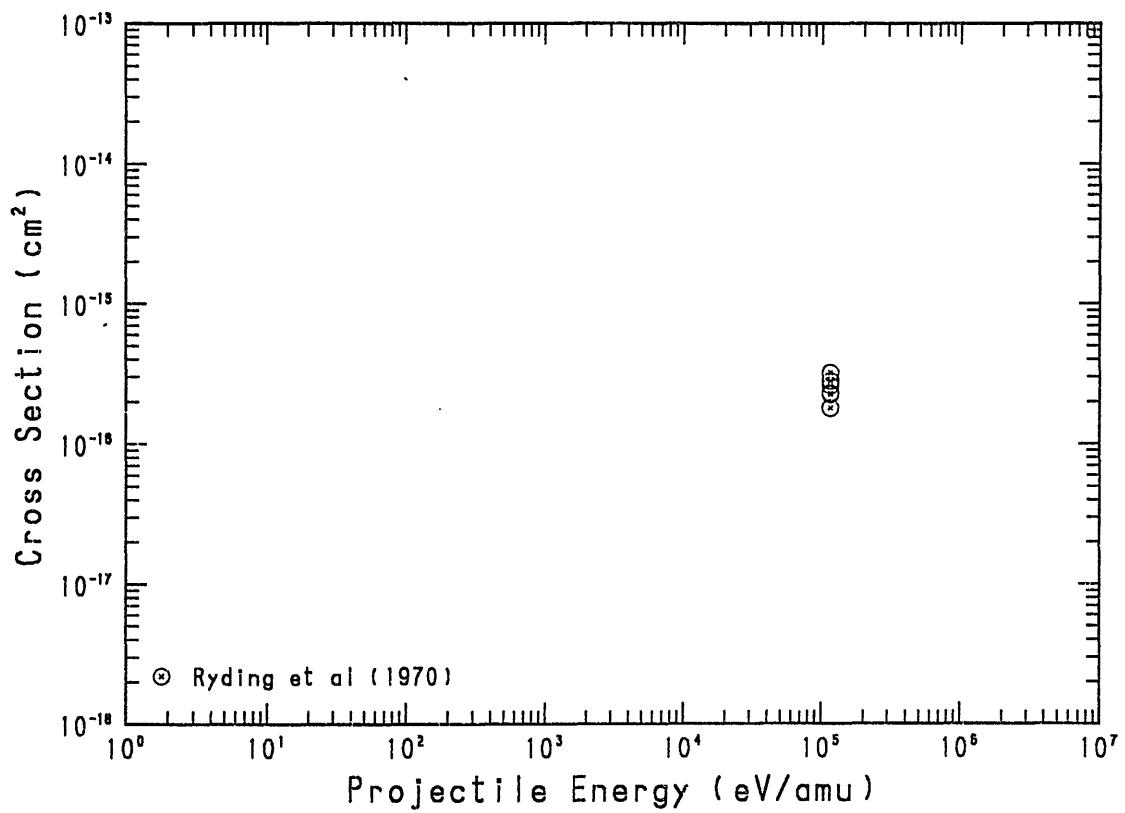


Fig.77 $K^+ + H_2 \rightarrow K$

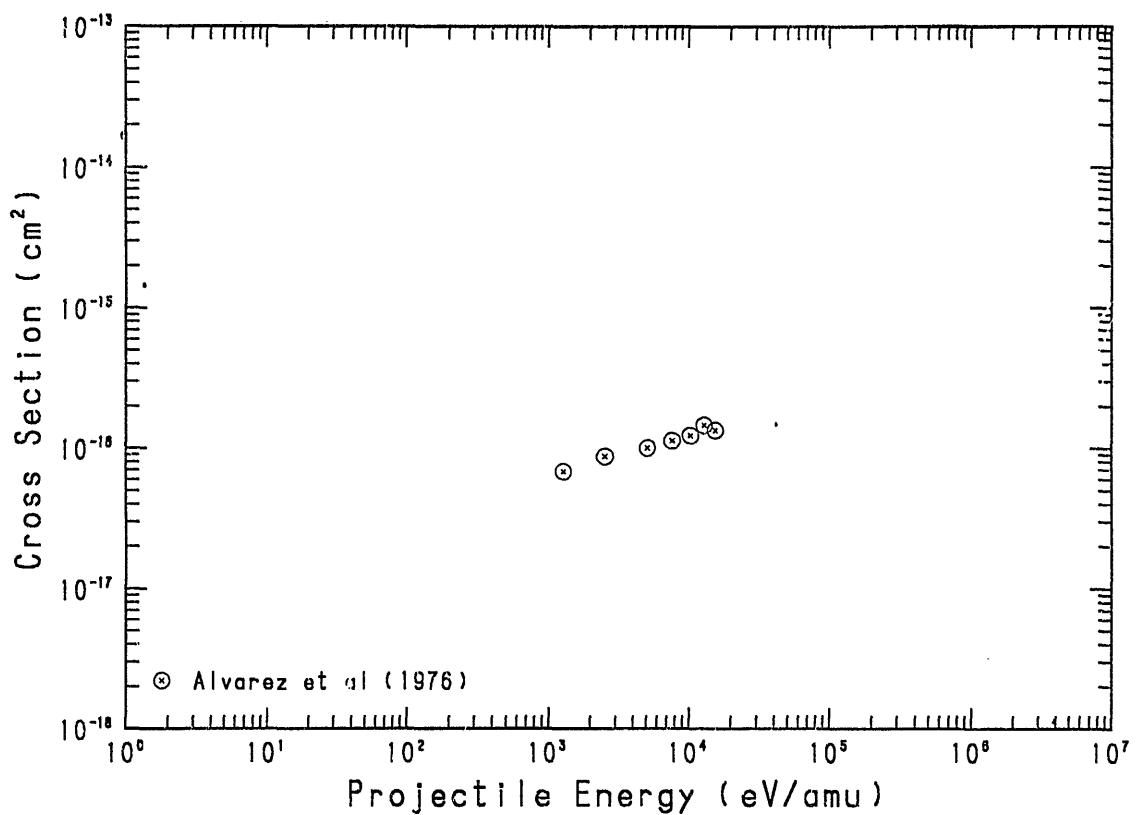


Fig.78 $Ar^+ + H_2 \rightarrow Ar$

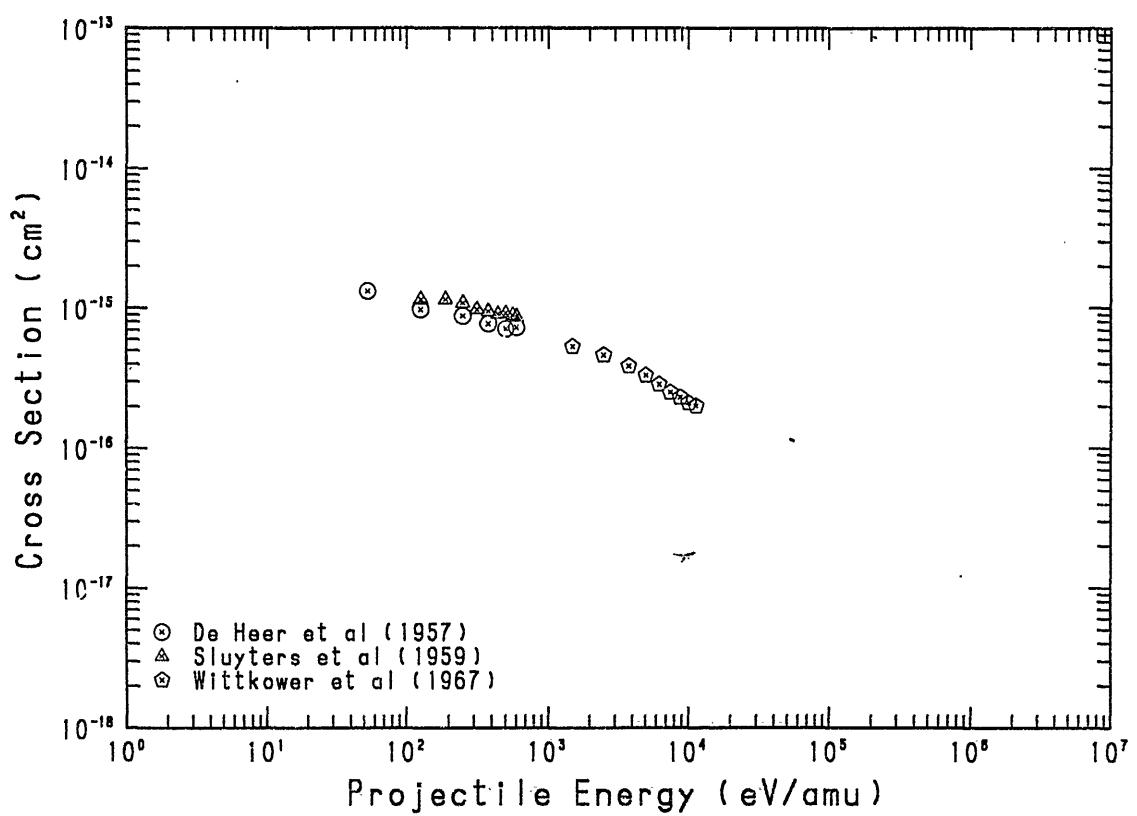


Fig.79 $\text{Ar}^{2+} + \text{H}_2 \rightarrow \text{Ar}^+$

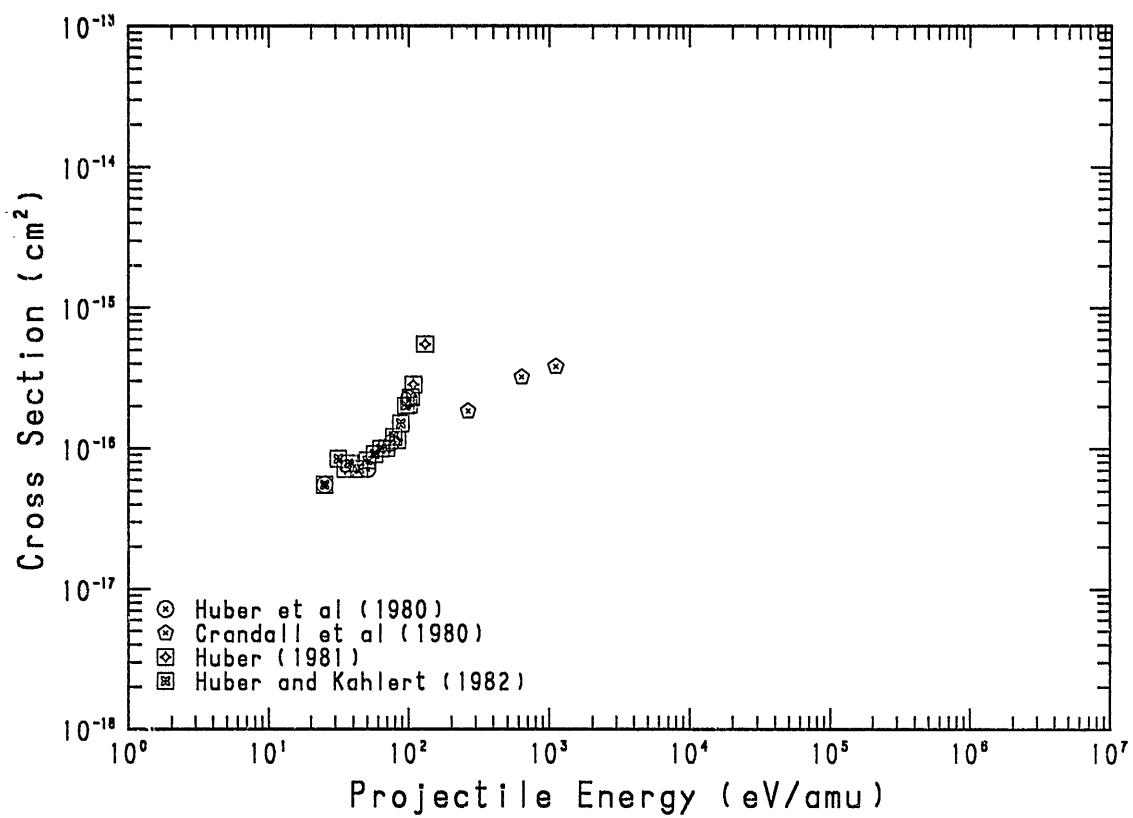


Fig.80 $\text{Ar}^{3+} + \text{H}_2 \rightarrow \text{Ar}^+$

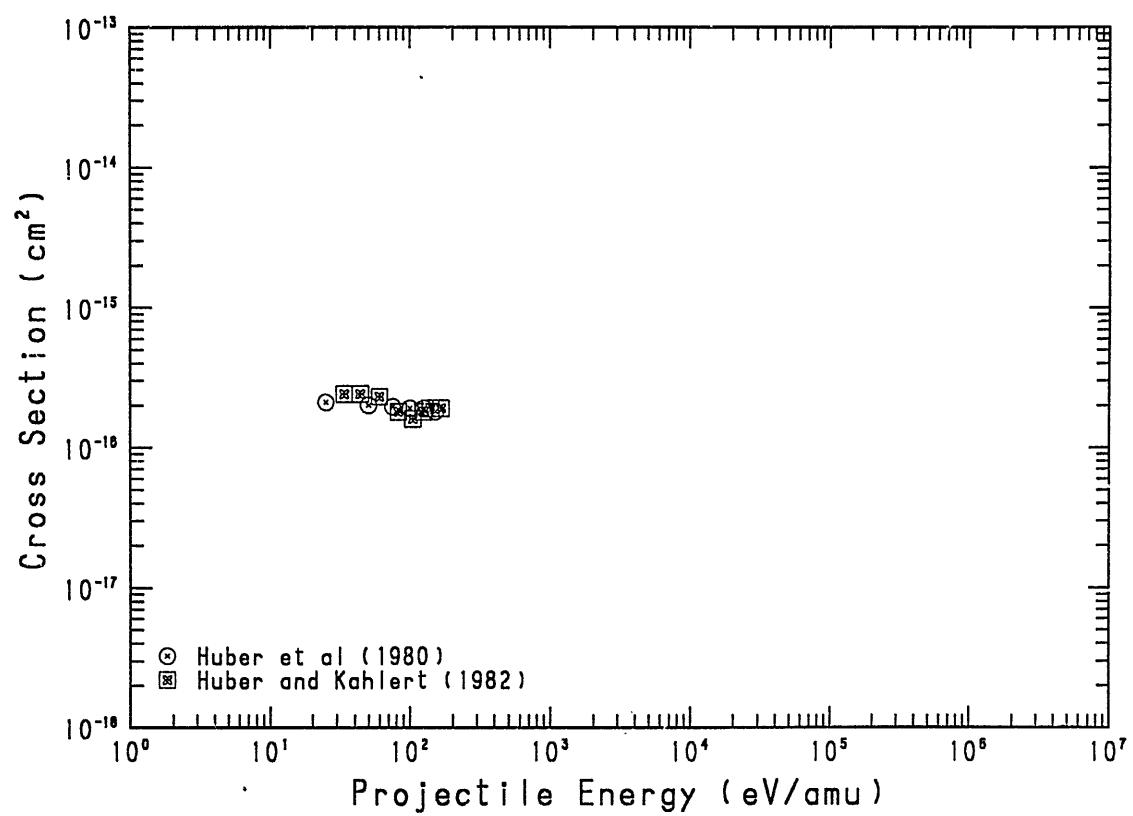


Fig. 81 $\text{Ar}^{3+} + \text{H}_2 \rightarrow \text{Ar}^{2+}$

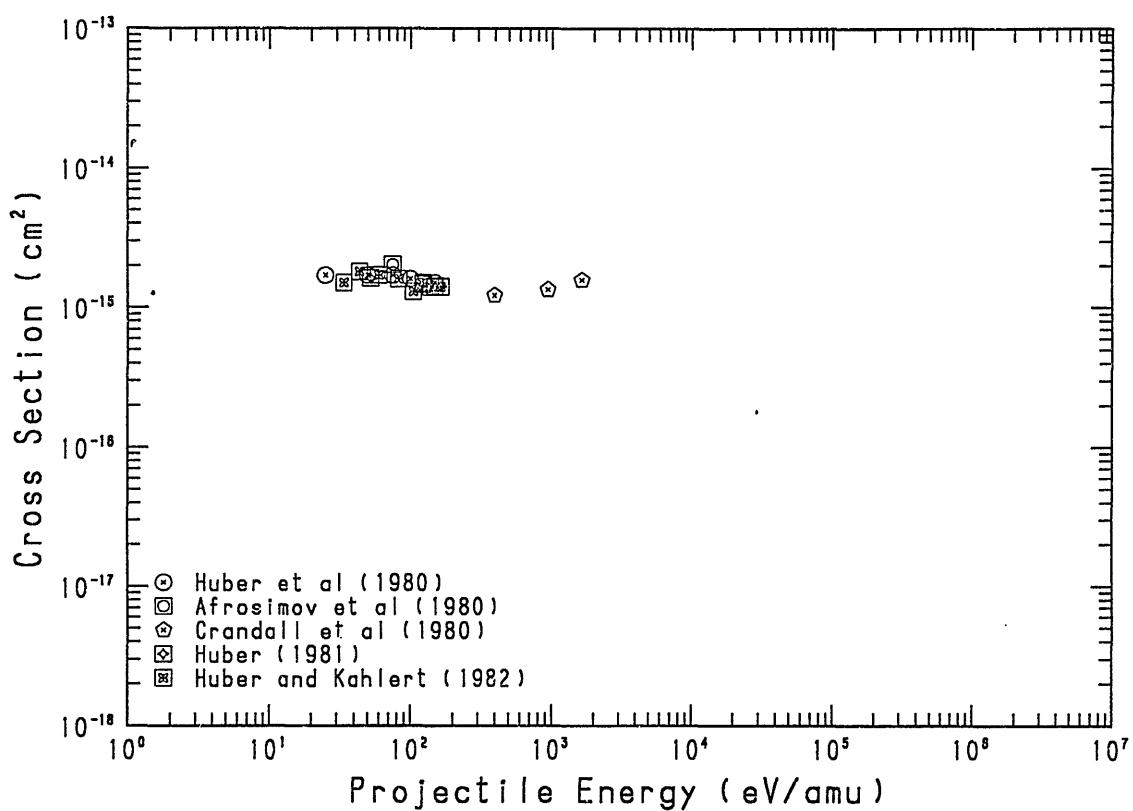


Fig. 82 $\text{Ar}^{4+} + \text{H}_2 \rightarrow \text{Ar}^{2+}$

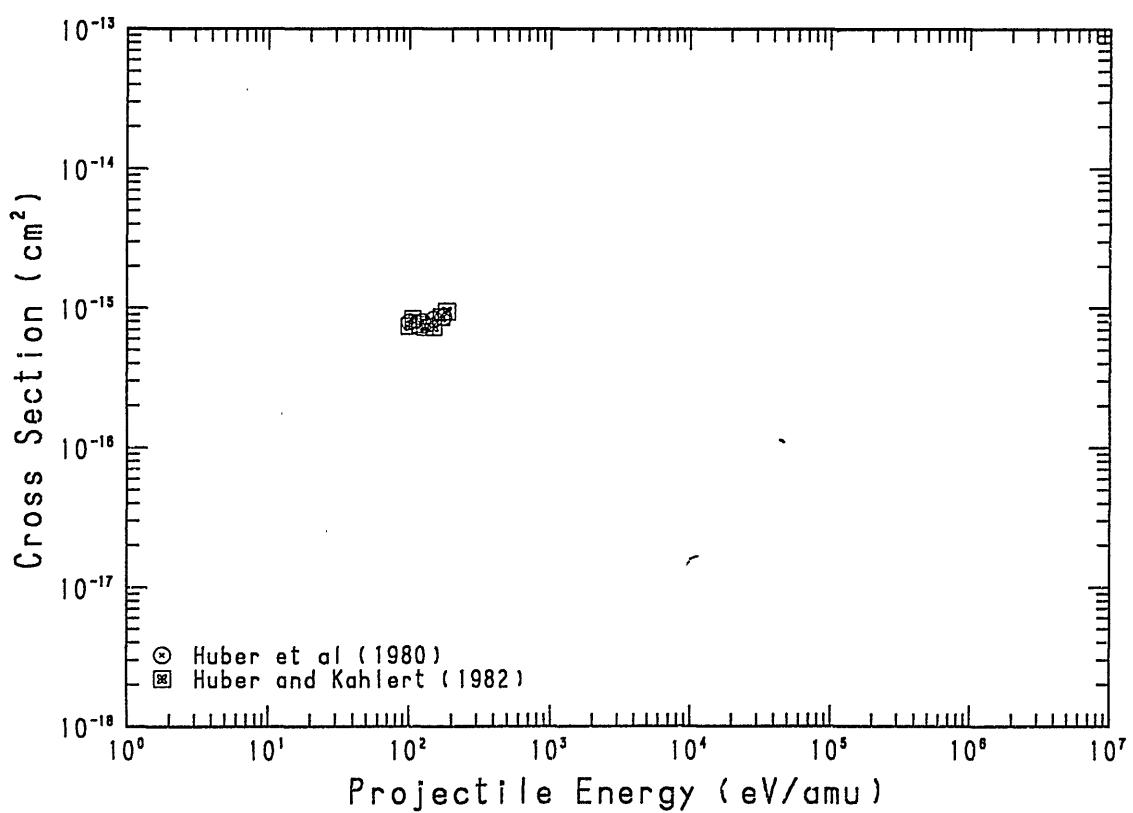


Fig. 83 $\text{Ar}^{4+} + \text{H}_2 \rightarrow \text{Ar}^{3+}$

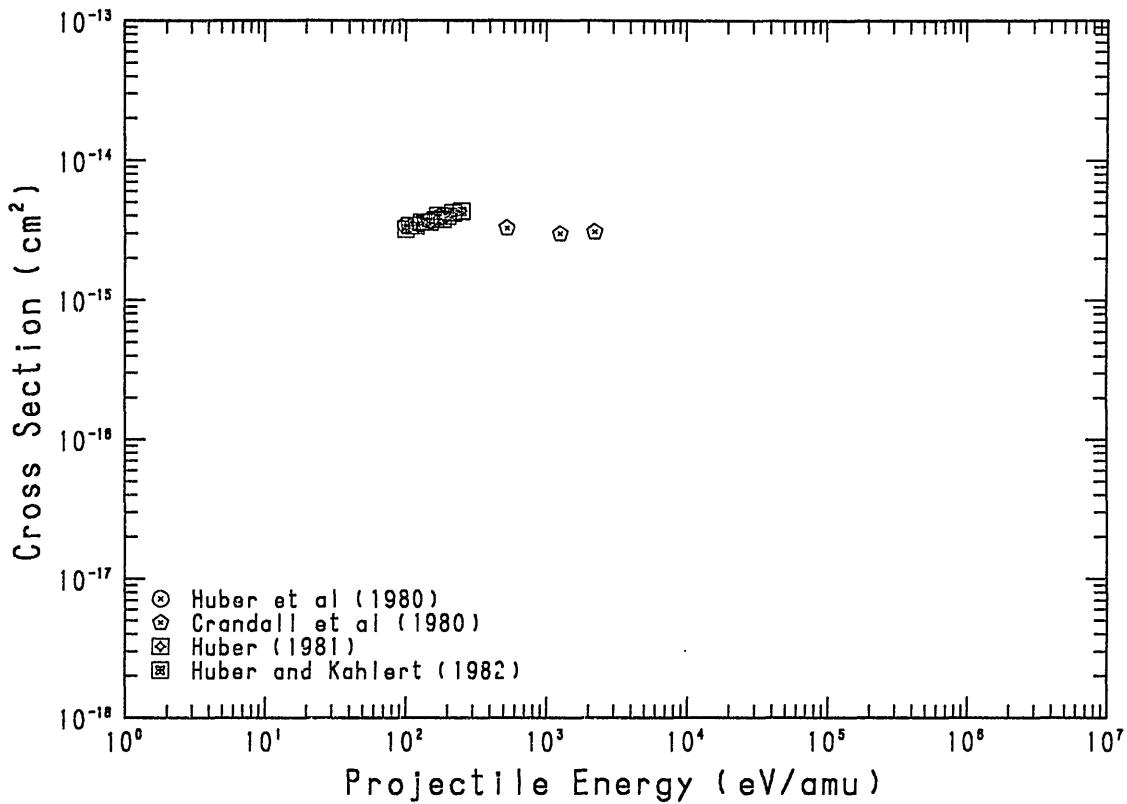


Fig. 84 $\text{Ar}^{5+} + \text{H}_2 \rightarrow \text{Ar}^{4+}$

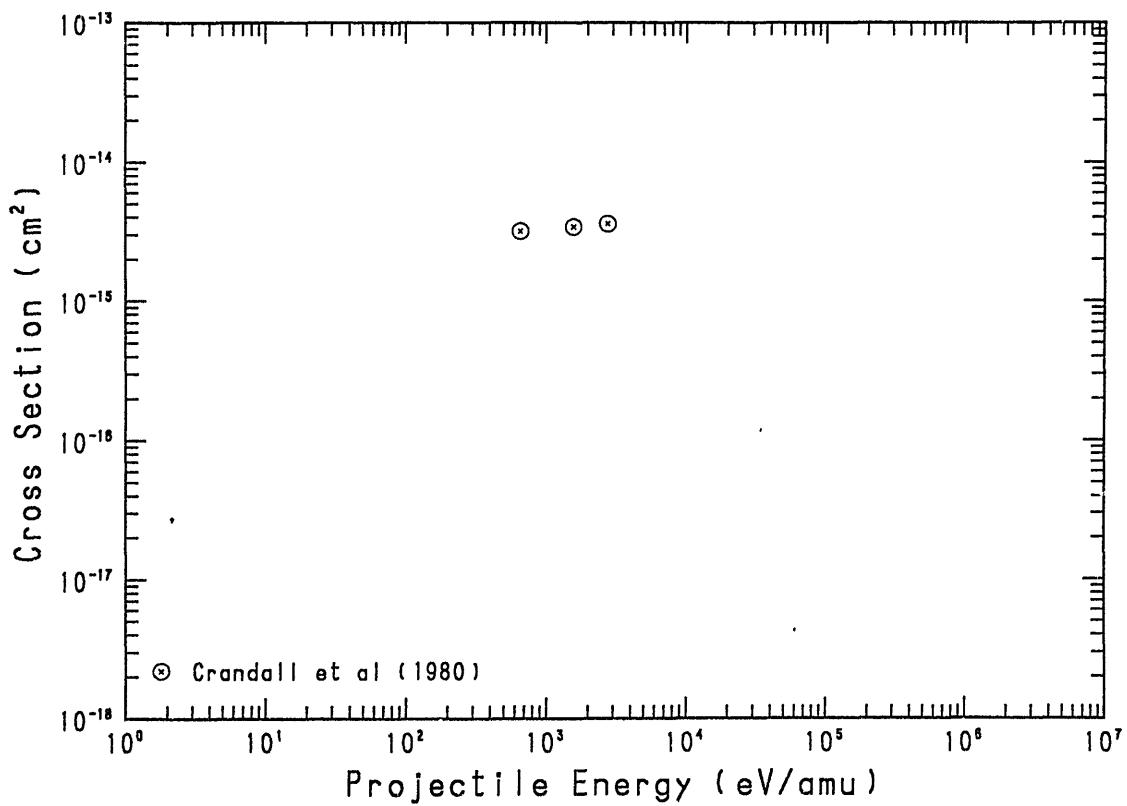


Fig. 85 $\text{Ar}^{6+} + \text{H}_2 \rightarrow \text{Ar}^{4+}$

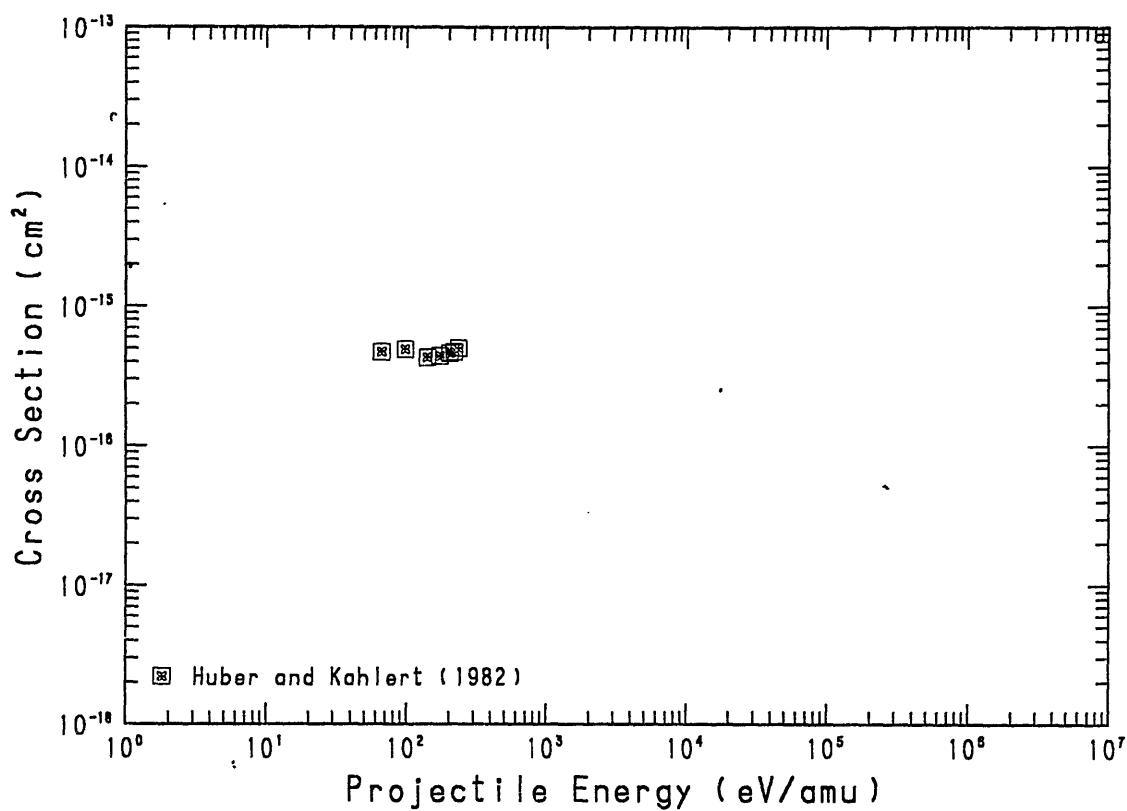


Fig. 86 $\text{Ar}^{6+} + \text{H}_2 \rightarrow \text{Ar}^{5+}$

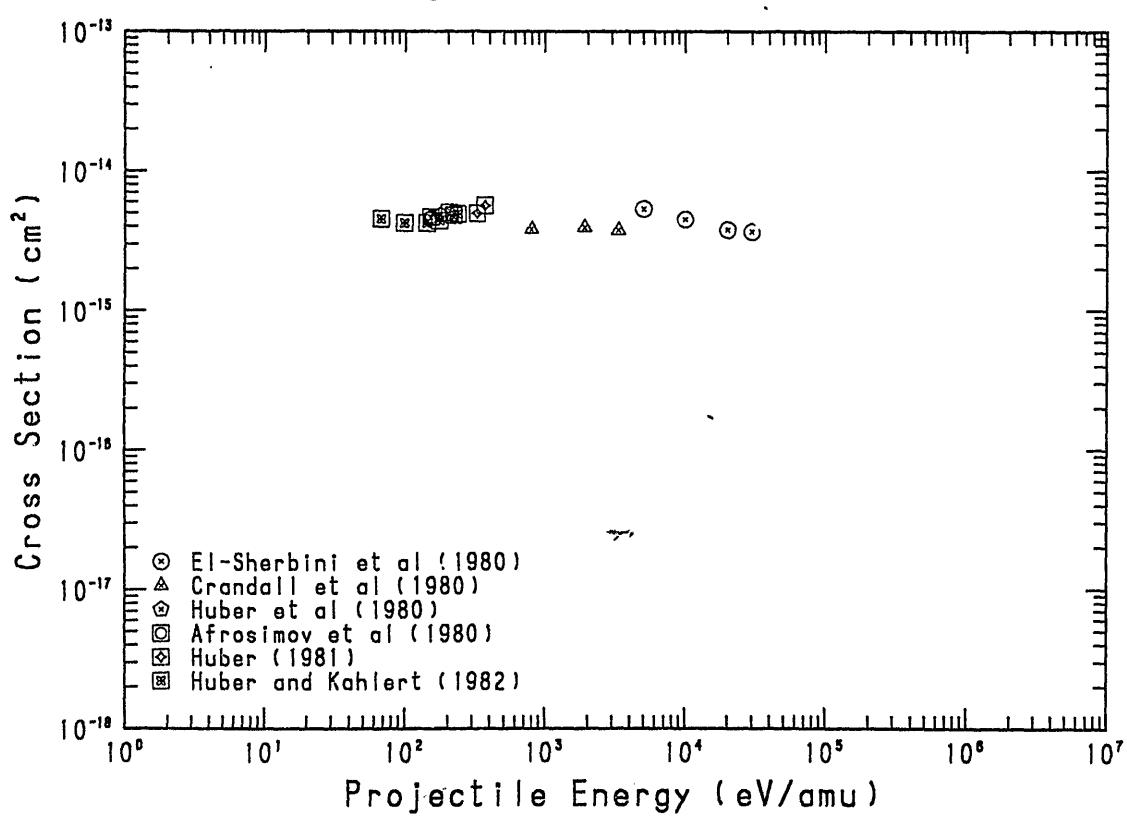


Fig. 87 $\text{Ar}^{7+} + \text{H}_2 \rightarrow \text{Ar}^{6+}$

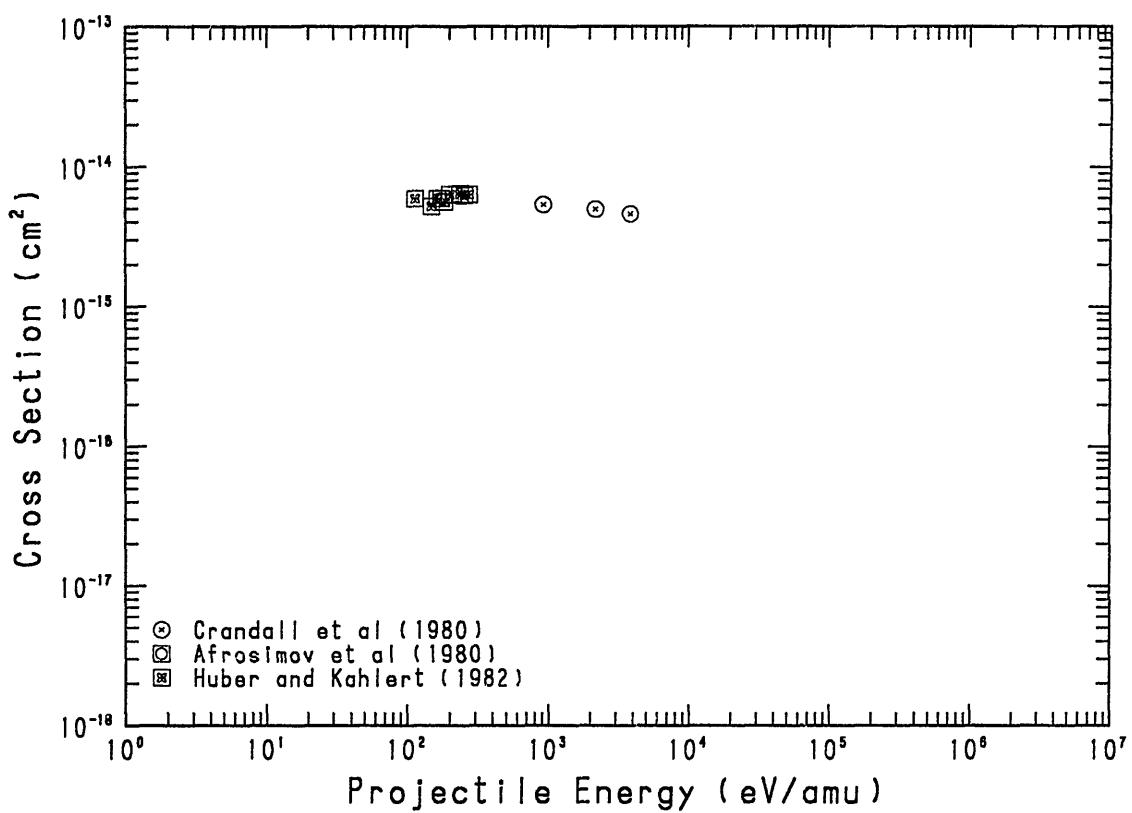


Fig. 88 $\text{Ar}^{8+} + \text{H}_2 \rightarrow \text{Ar}^{7+}$

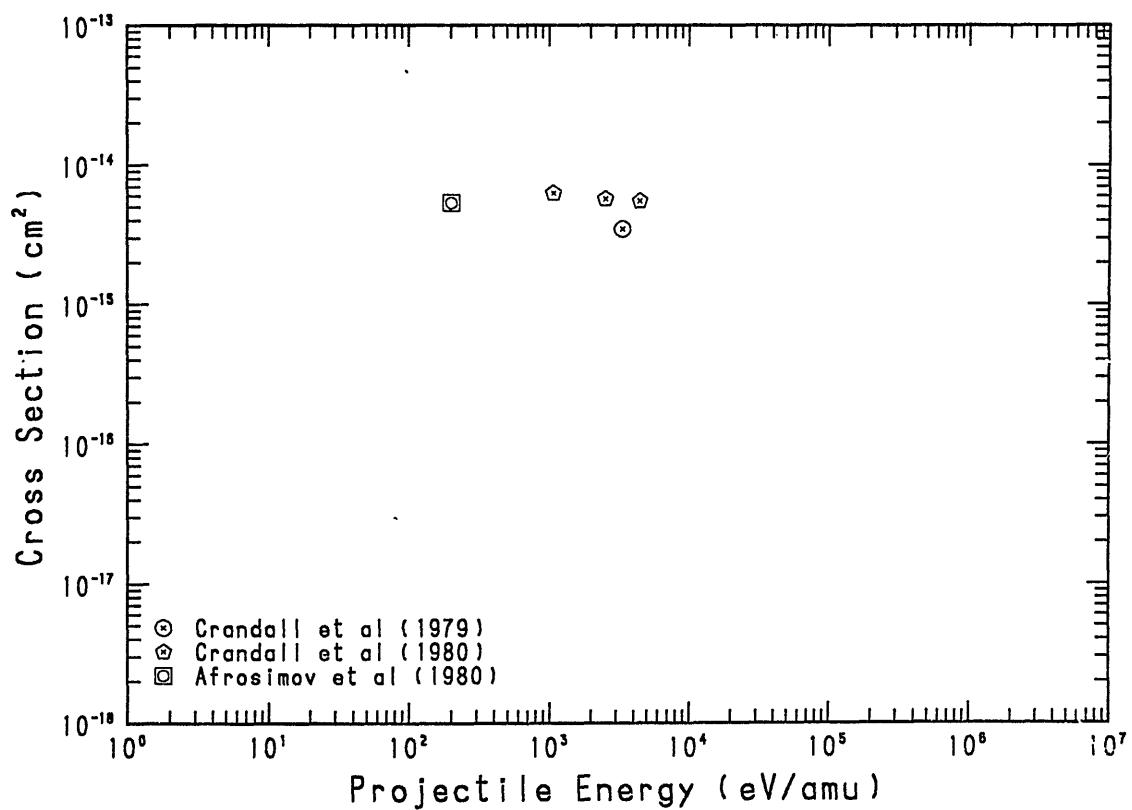


Fig. 89 $\text{Ar}^{9+} + \text{H}_2 \rightarrow \text{Ar}^{8+}$

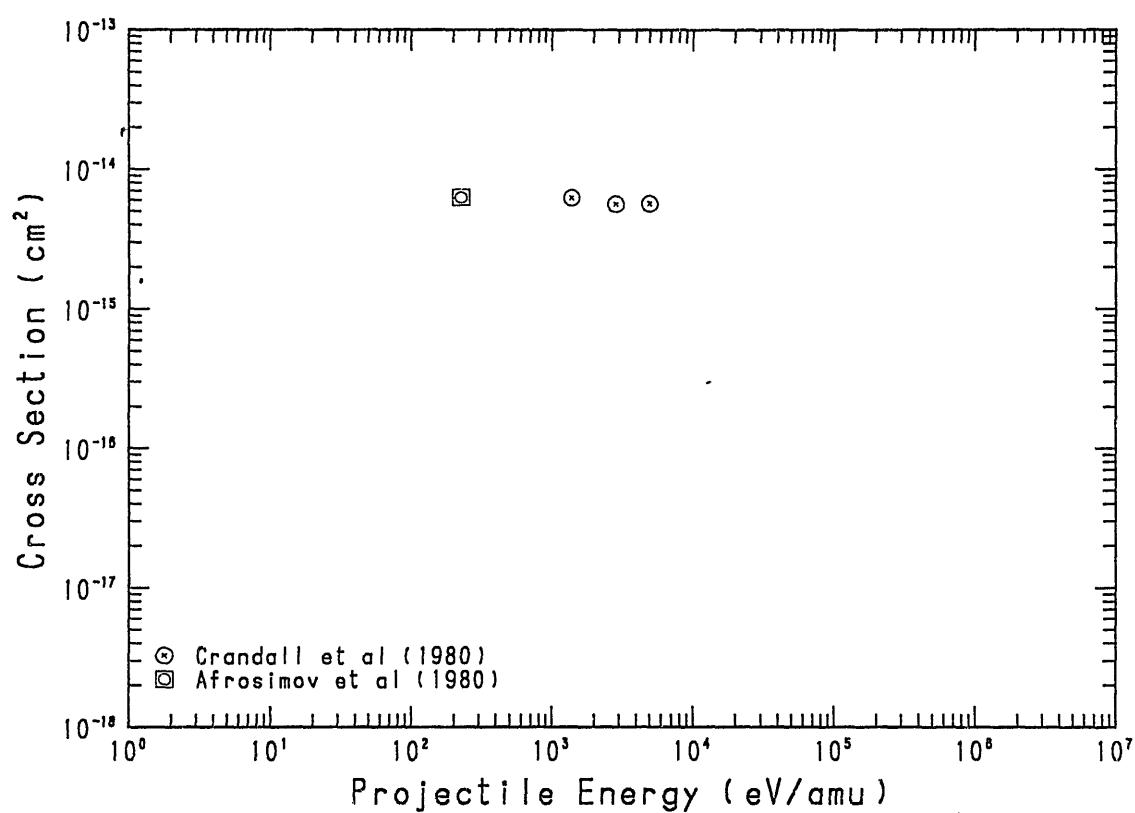


Fig. 90 $\text{Ar}^{10+} + \text{H}_2 \rightarrow \text{Ar}^{9+}$

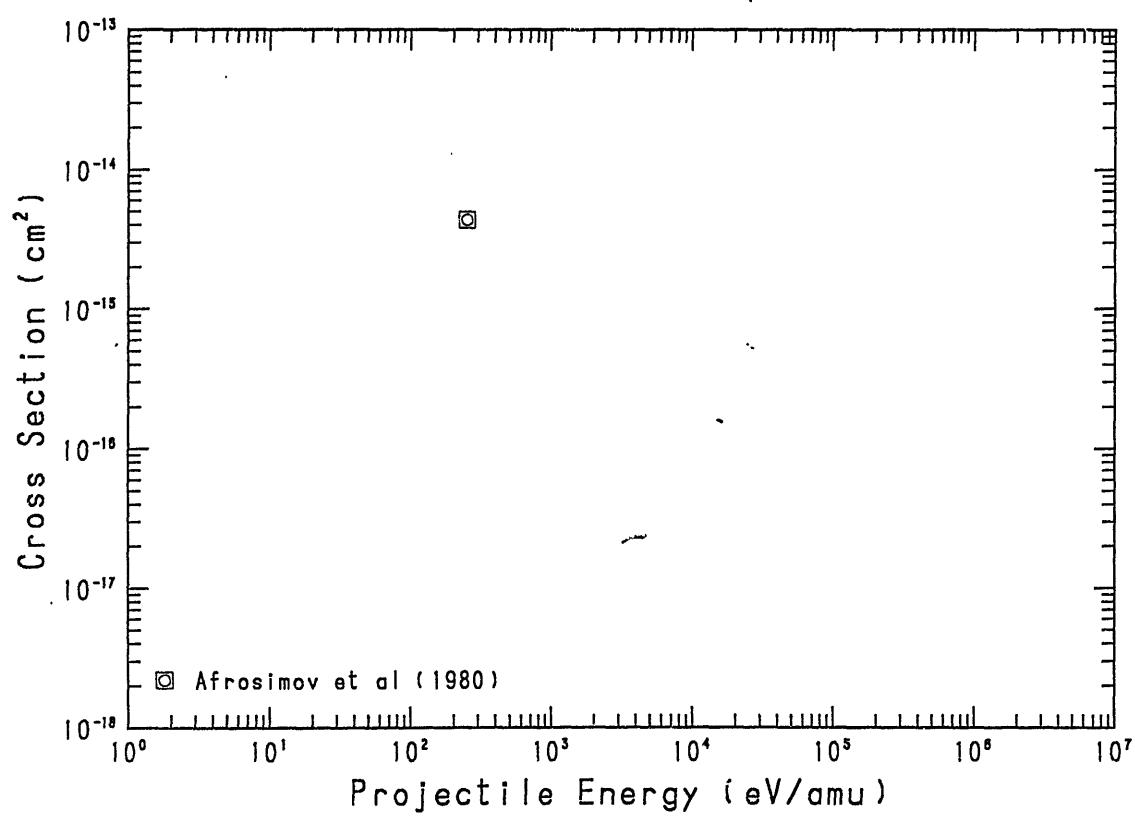


Fig. 91 $\text{Ar}^{18+} + \text{H}_2 \rightarrow \text{Ar}^{17+}$

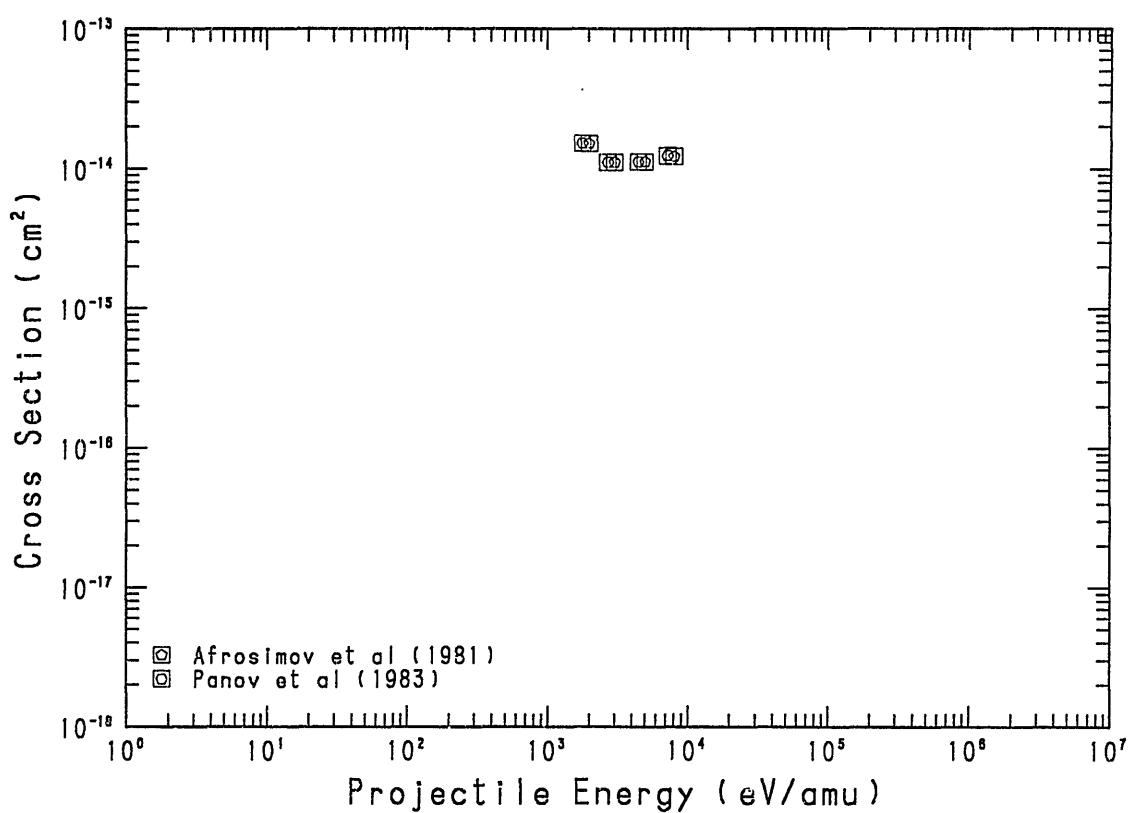


Fig. 92 $\text{Ti}^{2+} + \text{H}_2 \rightarrow \text{Ti}$

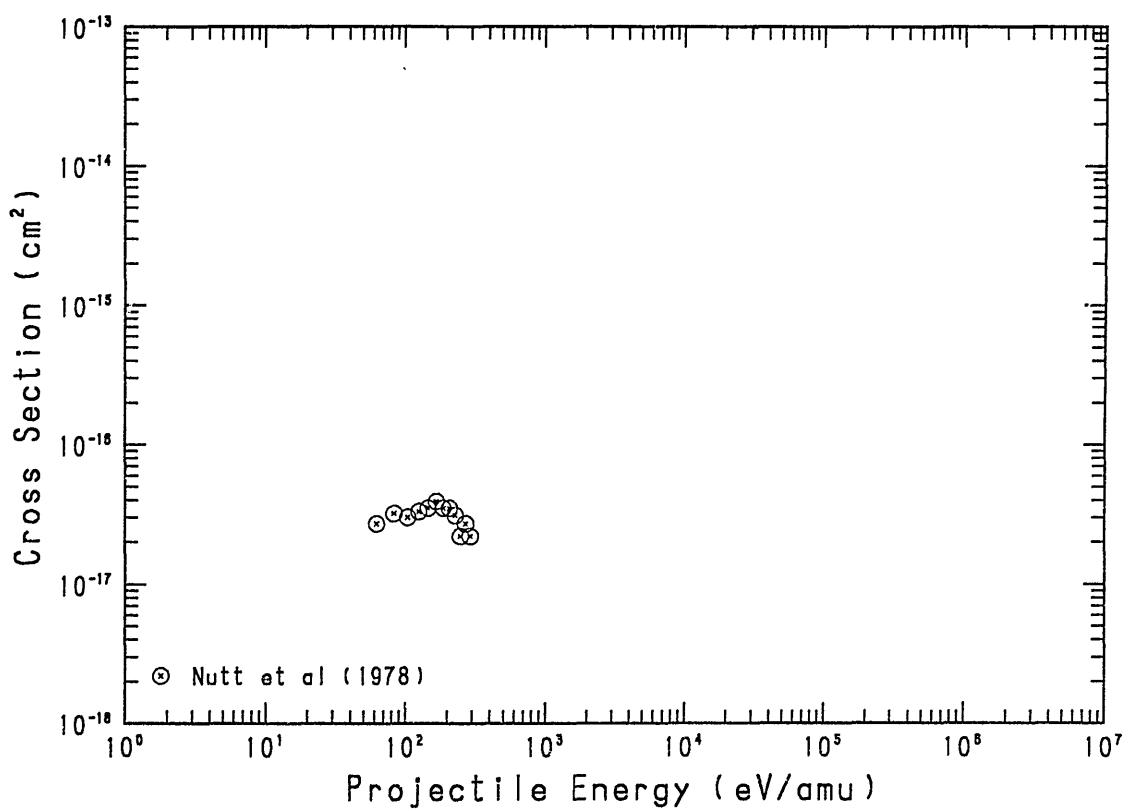


Fig. 93 $\text{Ti}^{2+} + \text{H}_2 \rightarrow \text{Ti}^+$

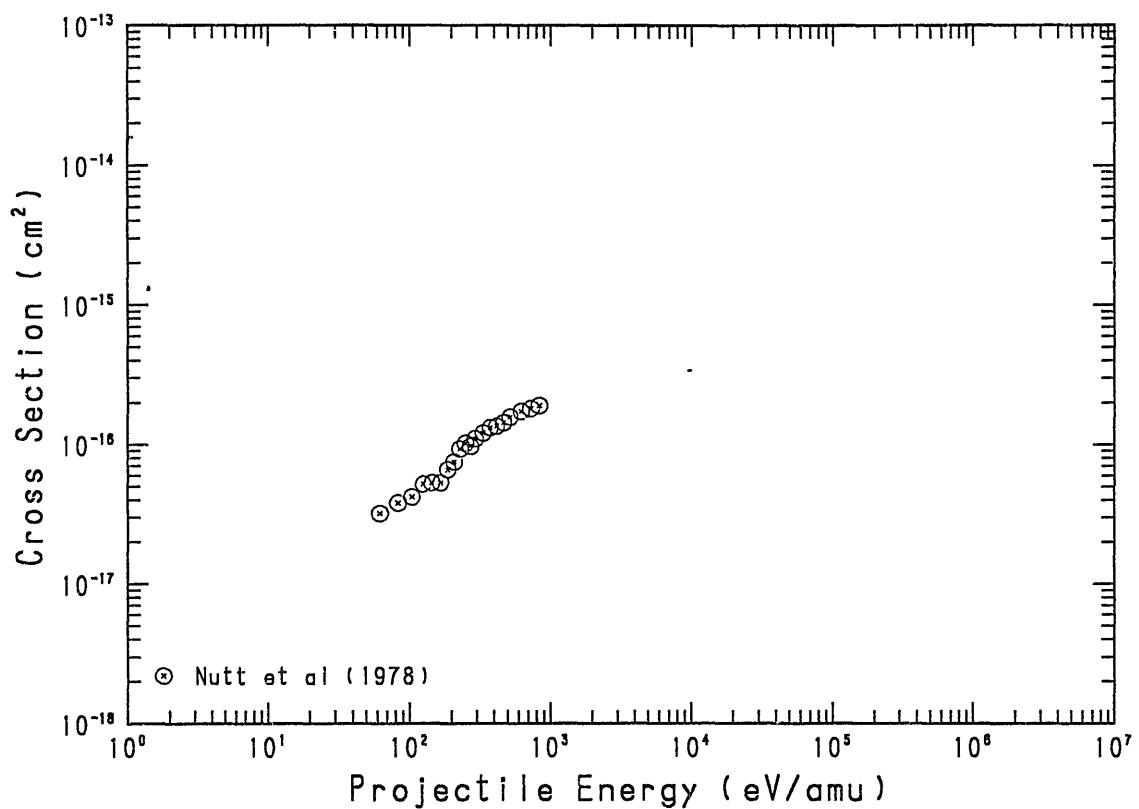


Fig. 94 $\text{Fe}^{3+} + \text{H}_2 \rightarrow \text{Fe}^+$

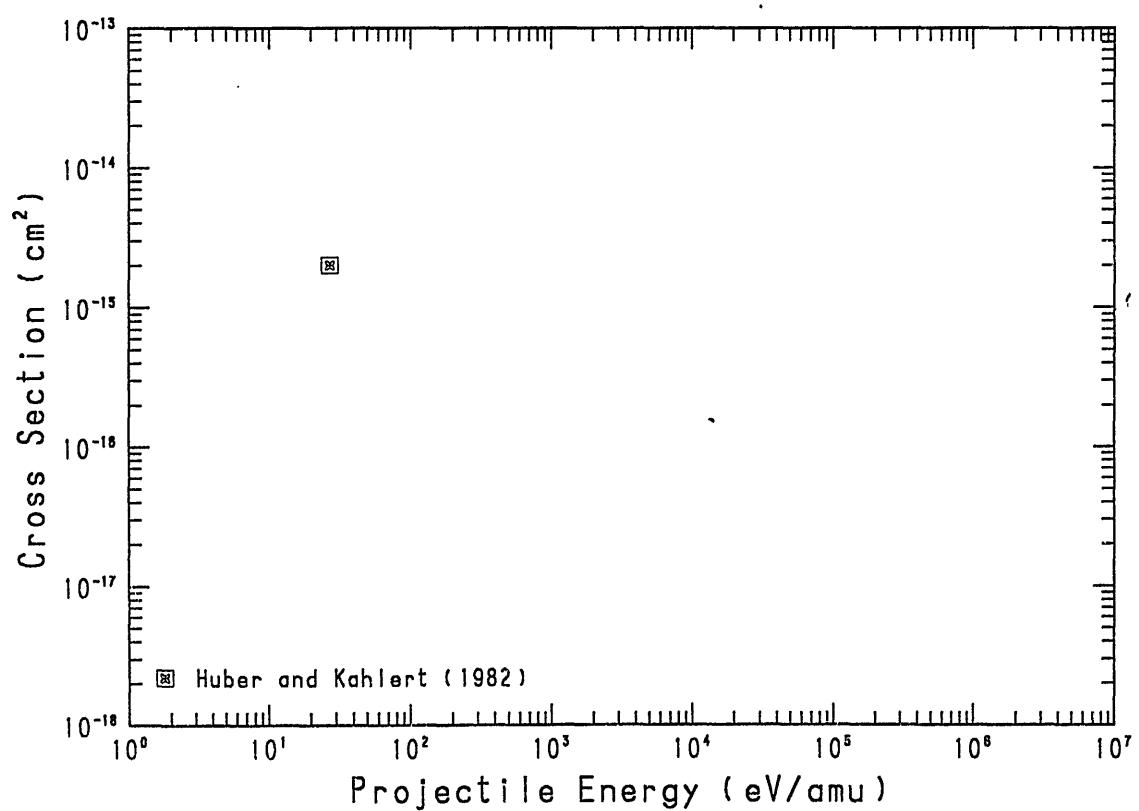


Fig. 95 $\text{Fe}^{3+} + \text{H}_2 \rightarrow \text{Fe}^{2+}$

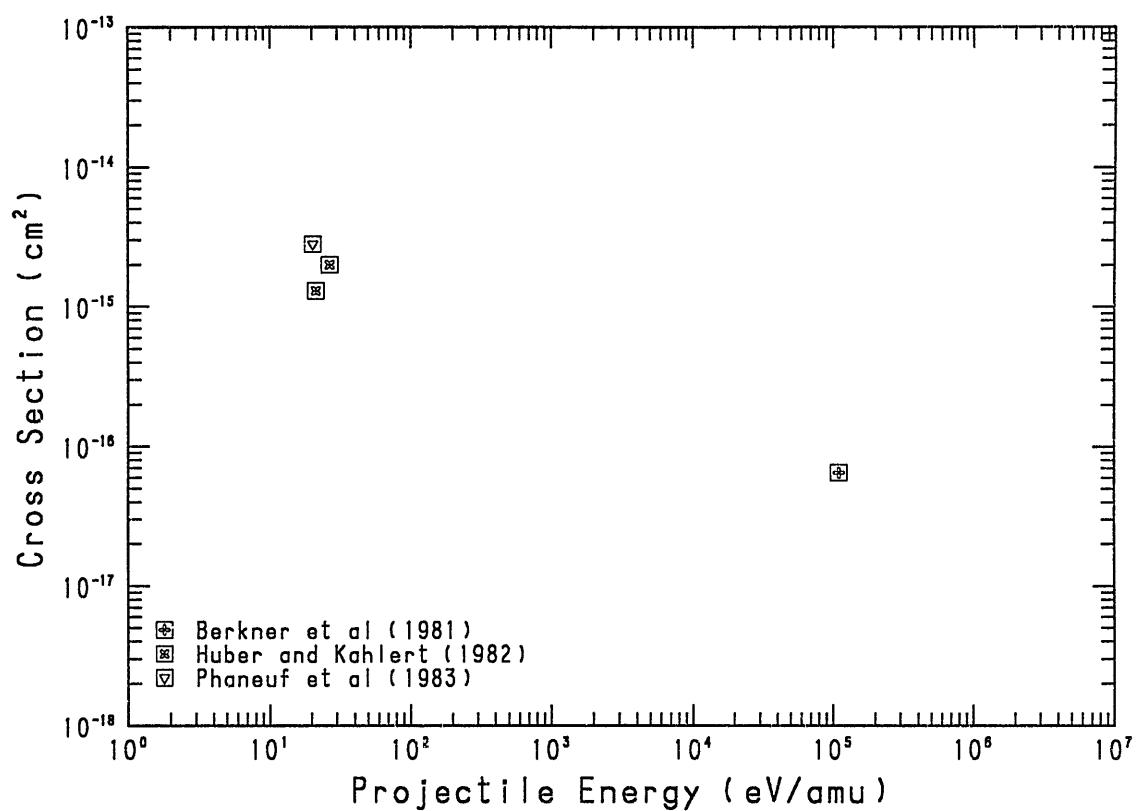


Fig. 96 $\text{Fe}^{4+} + \text{H}_2 \rightarrow \text{Fe}^{3+}$

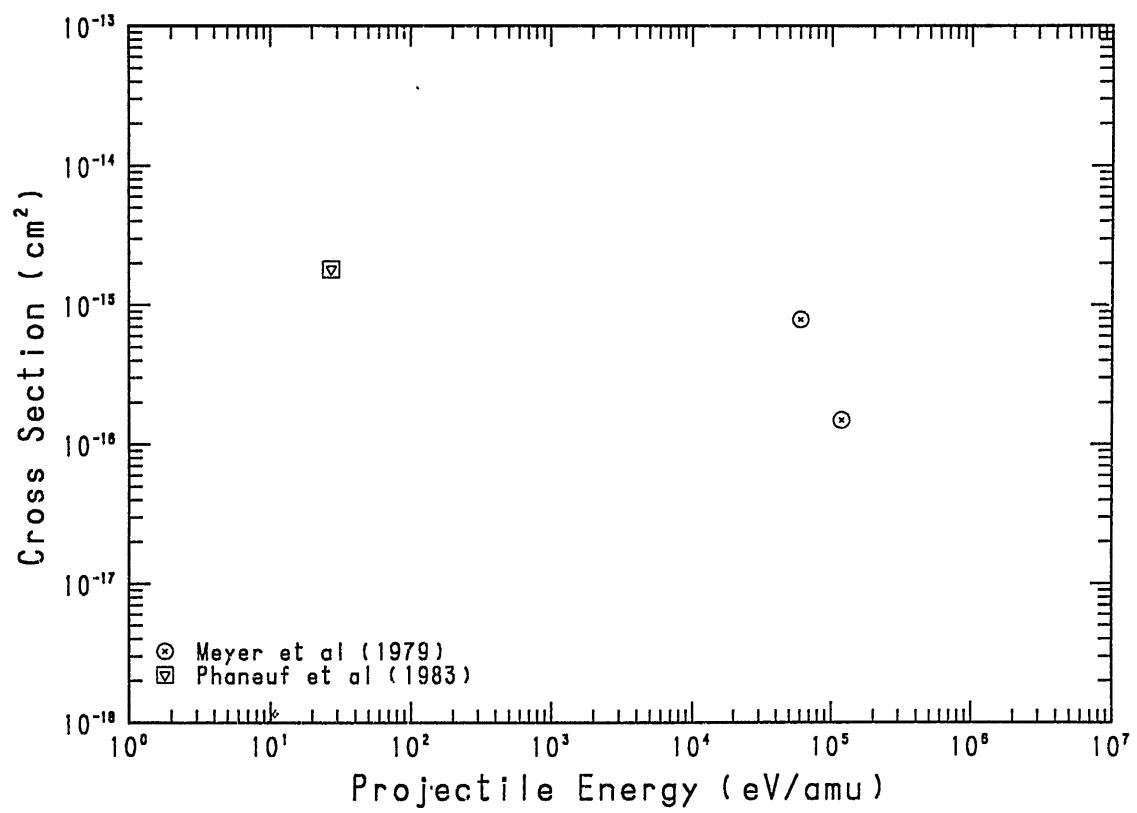


Fig. 97 $\text{Fe}^{5+} + \text{H}_2 \rightarrow \text{Fe}^{4+}$

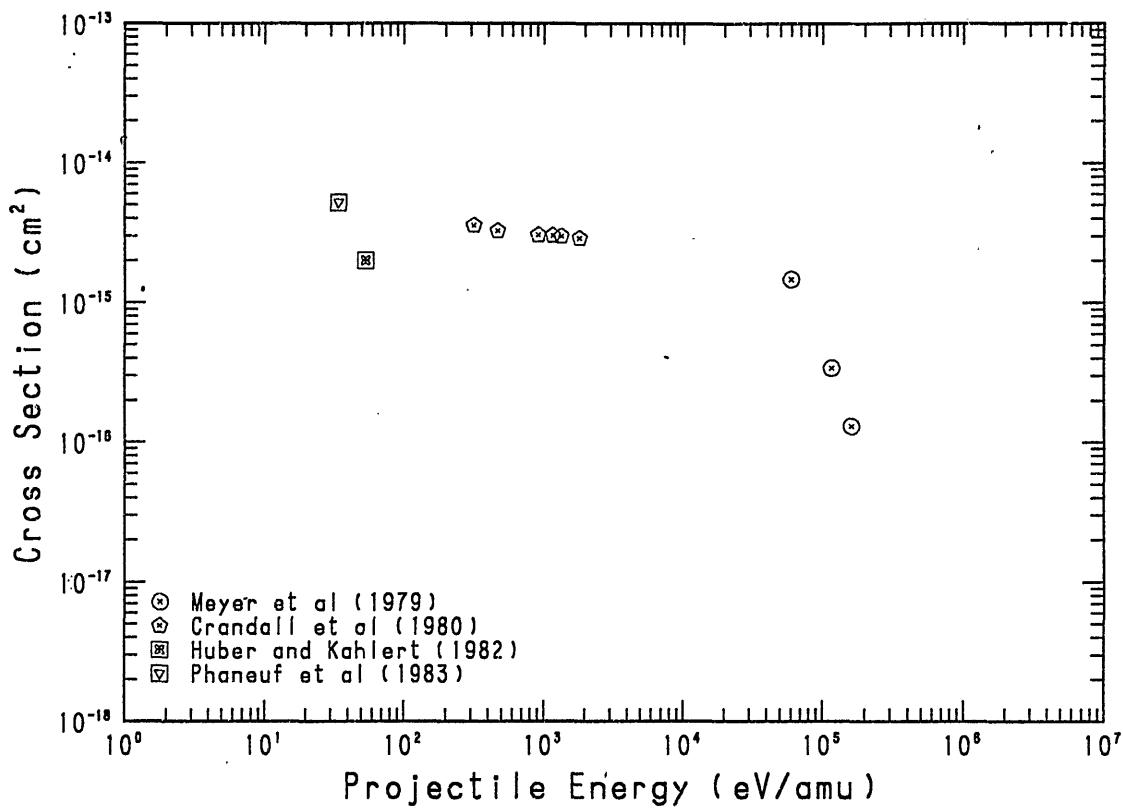


Fig. 98 $\text{Fe}^{6+} + \text{H}_2 \rightarrow \text{Fe}^{5+}$

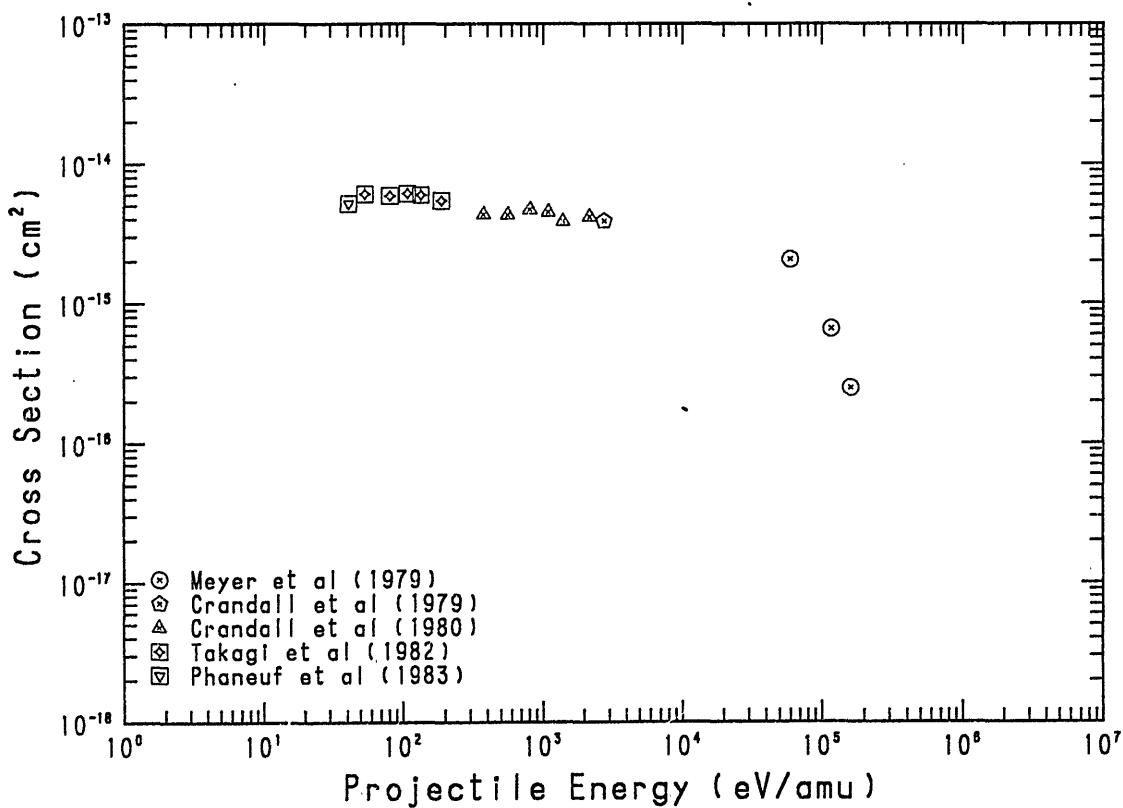


Fig. 99 ${}^{+7}\text{Fe} + \text{H}_2 \rightarrow {}^{+6}\text{Fe}$

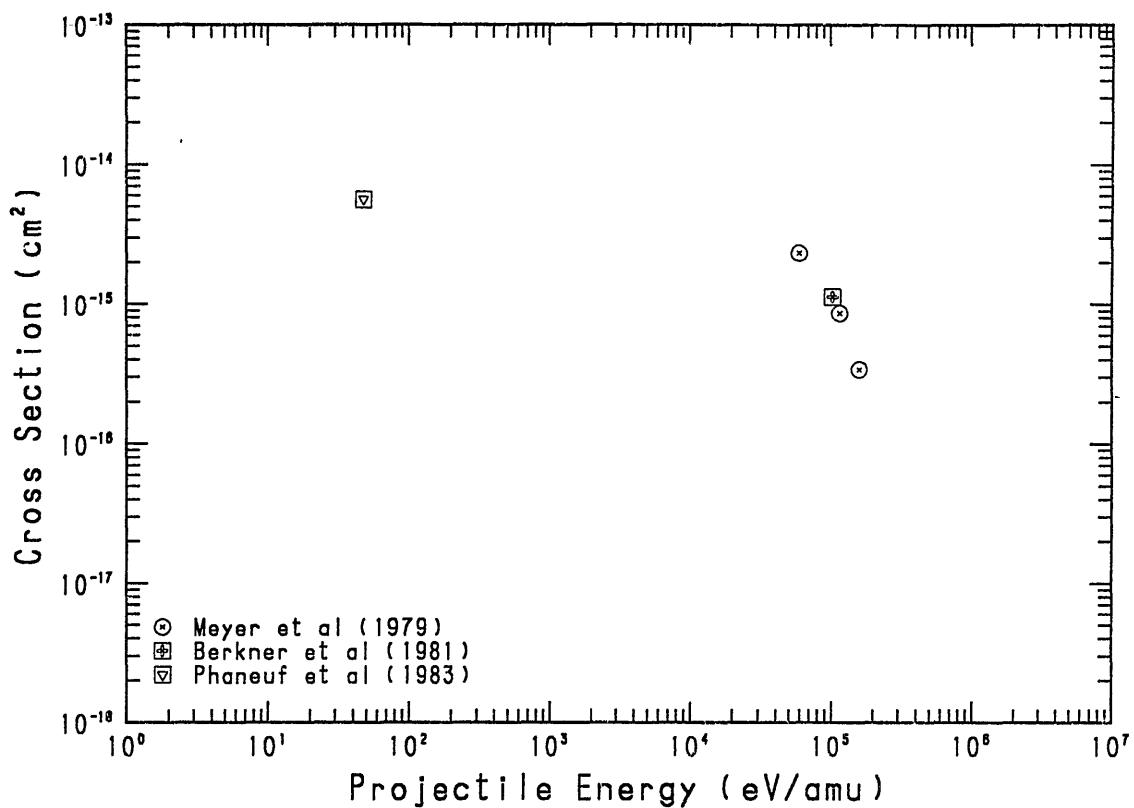


Fig. 100 ${}^{+8}\text{Fe} + \text{H}_2 \rightarrow {}^{+7}\text{Fe}$

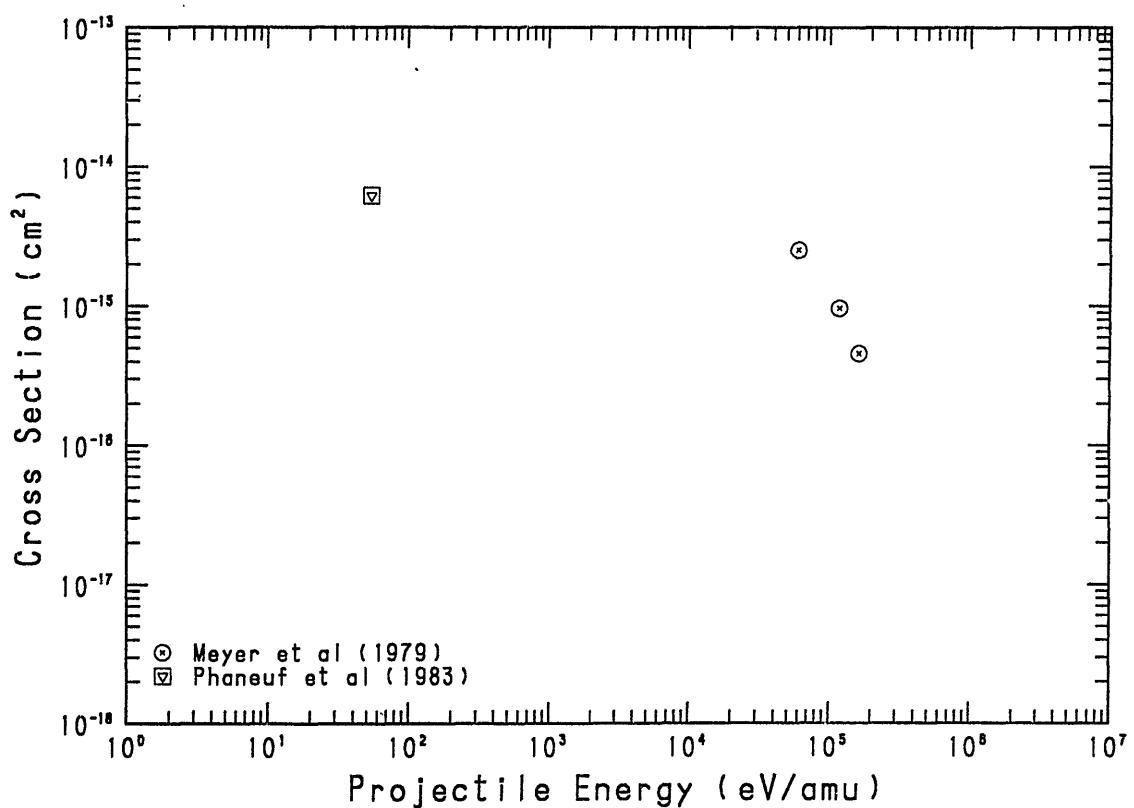


Fig. 101 $\text{Fe}^{9+} + \text{H}_2 \rightarrow \text{Fe}^{8+}$

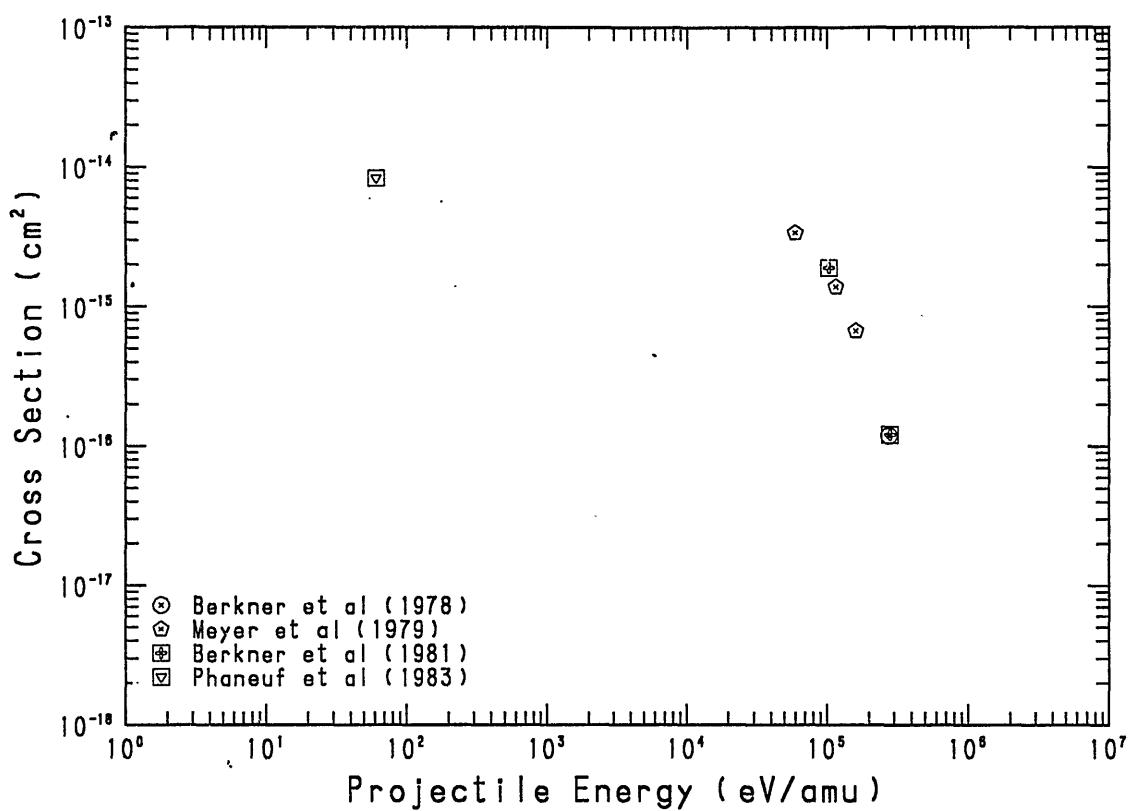


Fig. 102 $\text{Fe}^{10+} + \text{H}_2 \rightarrow \text{Fe}^{9+}$

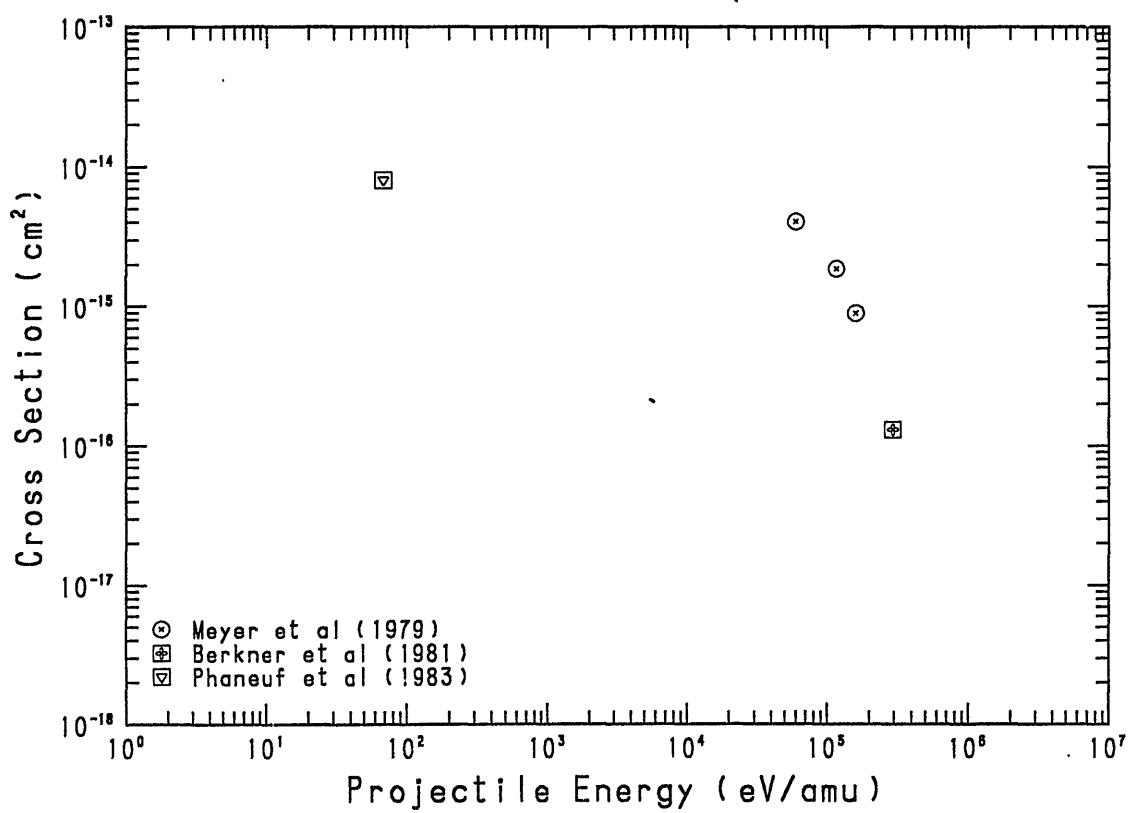


Fig.103 $\cdot \text{Fe}^{11+} + \text{H}_2 \rightarrow \text{Fe}^{10+}$

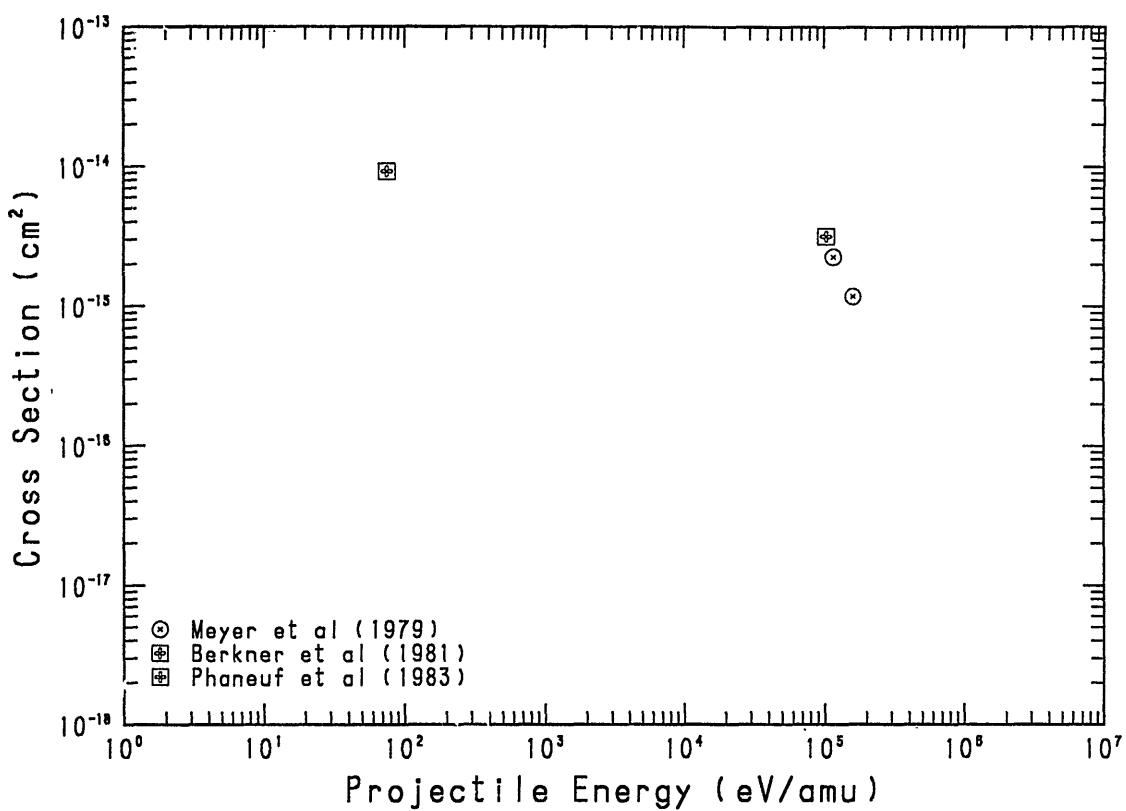


Fig.104 $\text{Fe}^{12+} + \text{H}_2 \rightarrow \text{Fe}^{10+}$

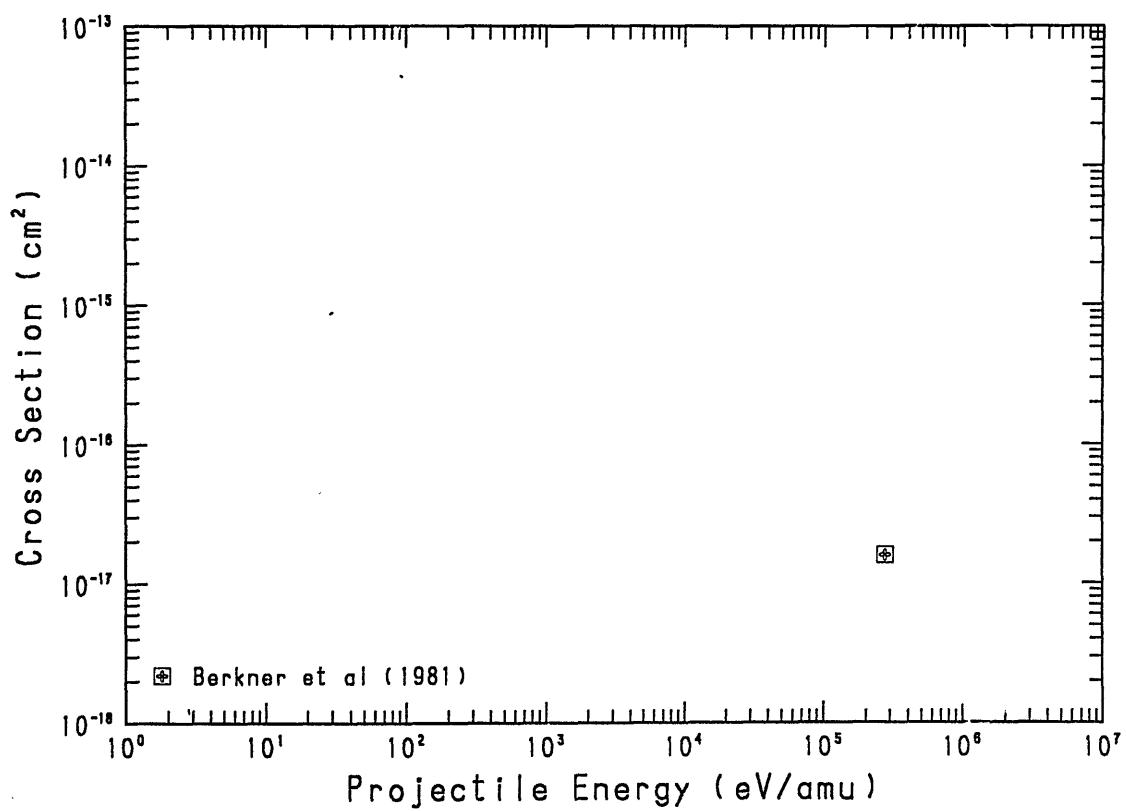


Fig. 105 $\text{Fe}^{12+} + \text{H}_2 \rightarrow \text{Fe}^{11+}$

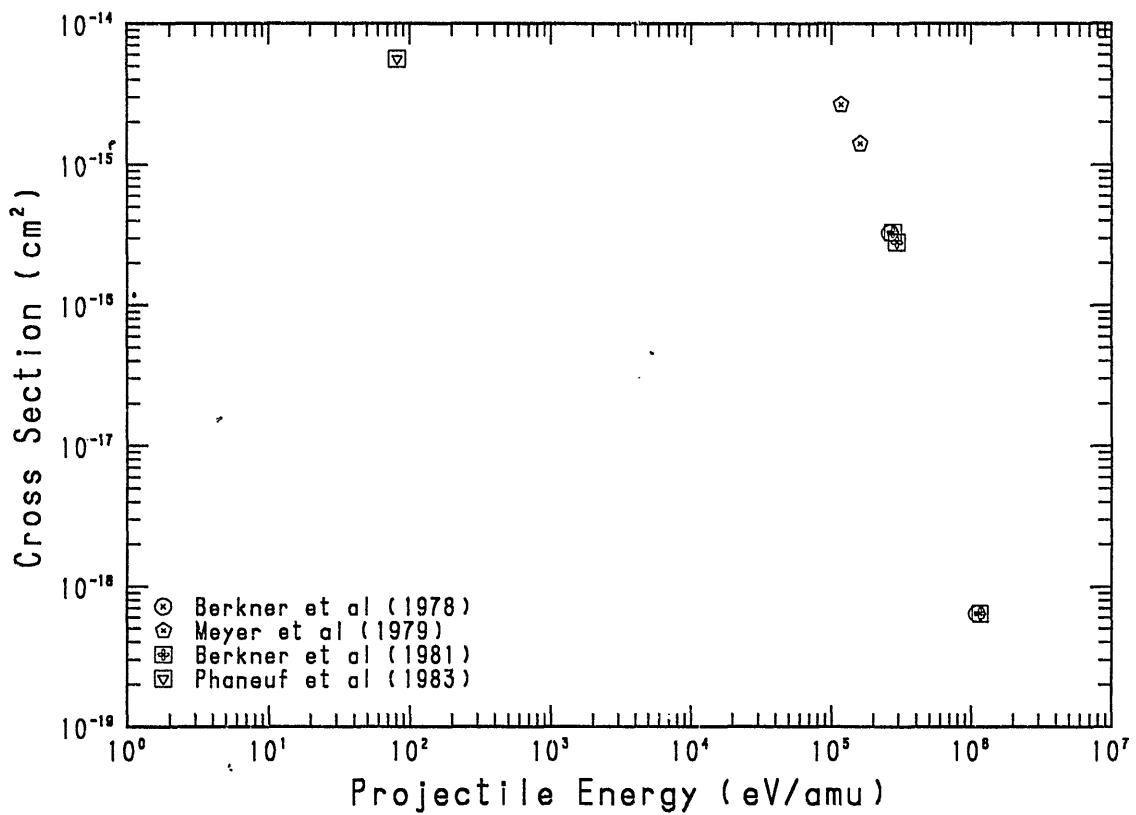


Fig. 106 $\text{Fe}^{13+} + \text{H}_2 \rightarrow \text{Fe}^{12+}$

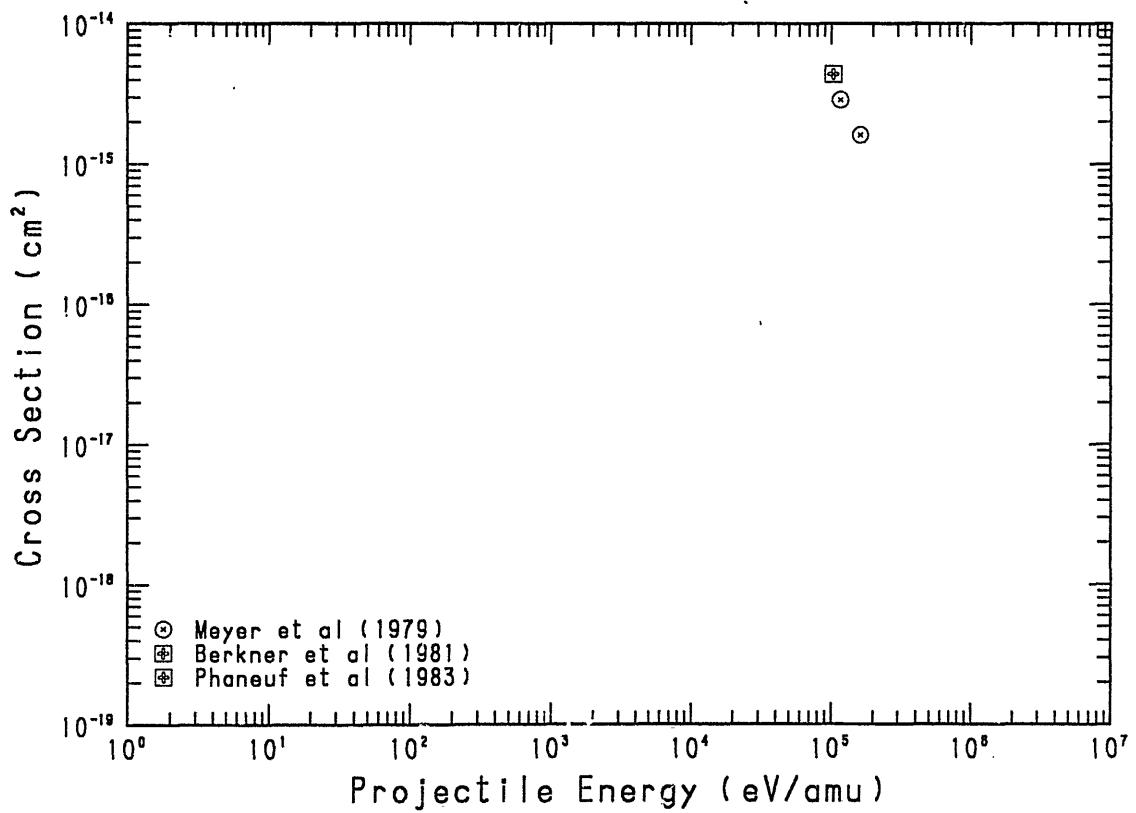


Fig.107 $\text{Fe}^{14+} + \text{H}_2 \rightarrow \text{Fe}^{12+}$

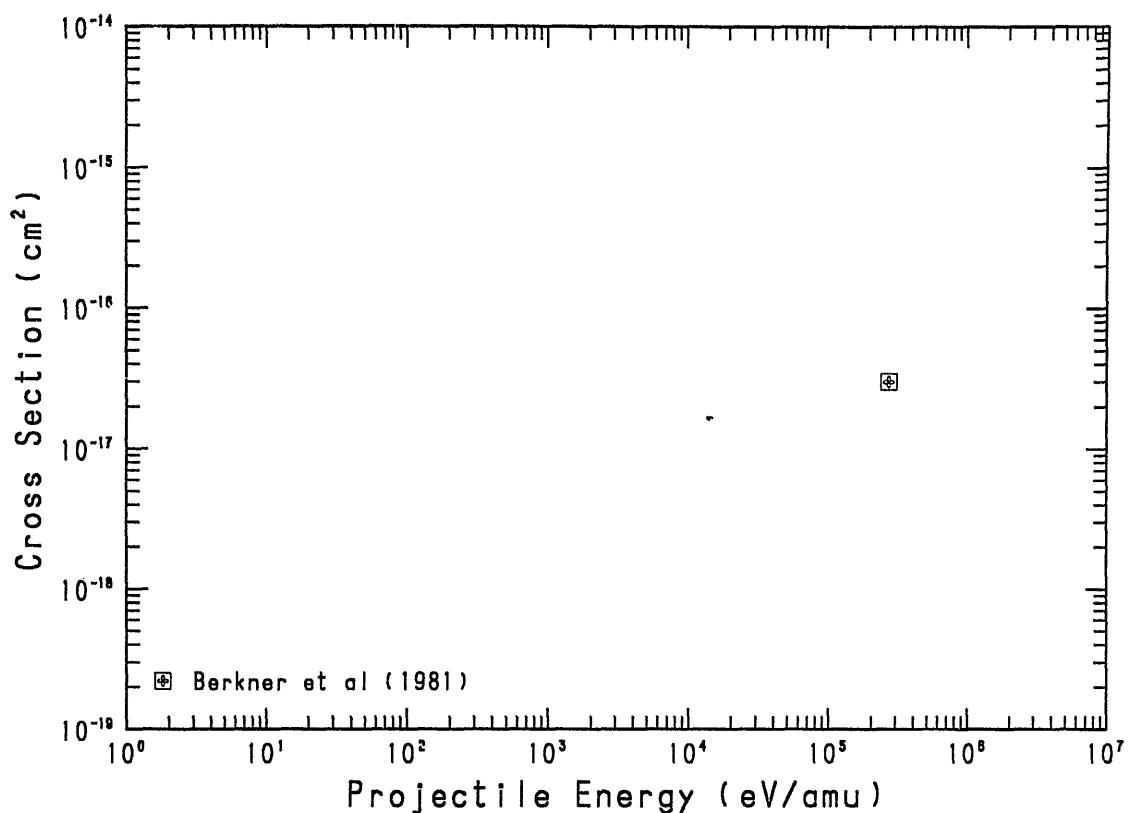


Fig.108 $\text{Fe}^{14+} + \text{H}_2 \rightarrow \text{Fe}^{13+}$

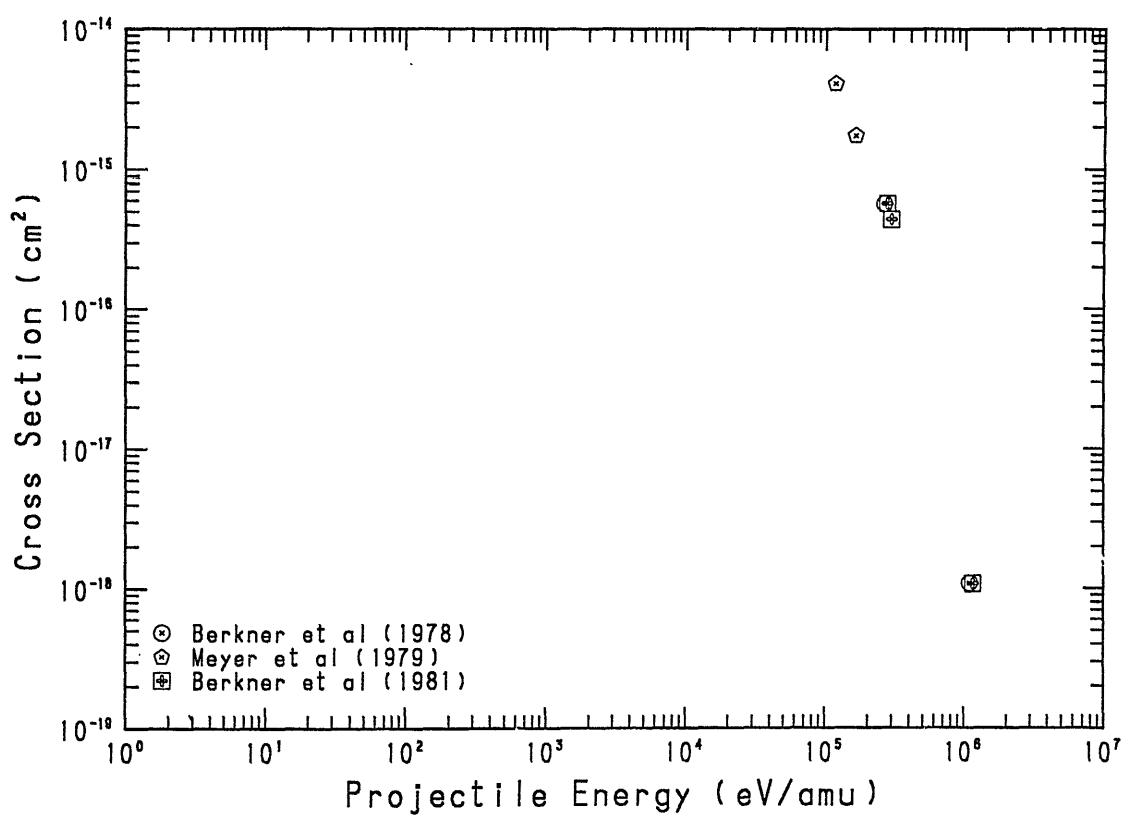


Fig. 109 $\text{Fe}^{15+} + \text{H}_2 \rightarrow \text{Fe}^{14+}$

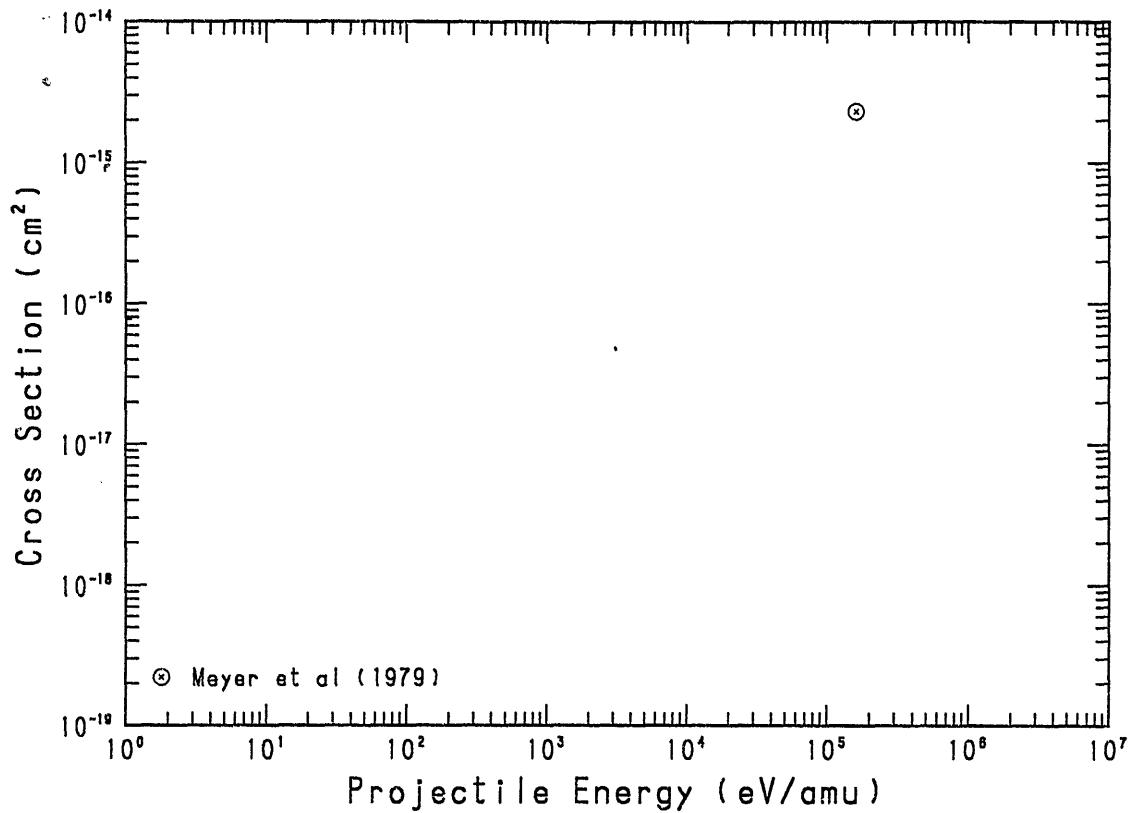


Fig. 110 $\text{Fe}^{16+} + \text{H}_2 \rightarrow \text{Fe}^{14+}$

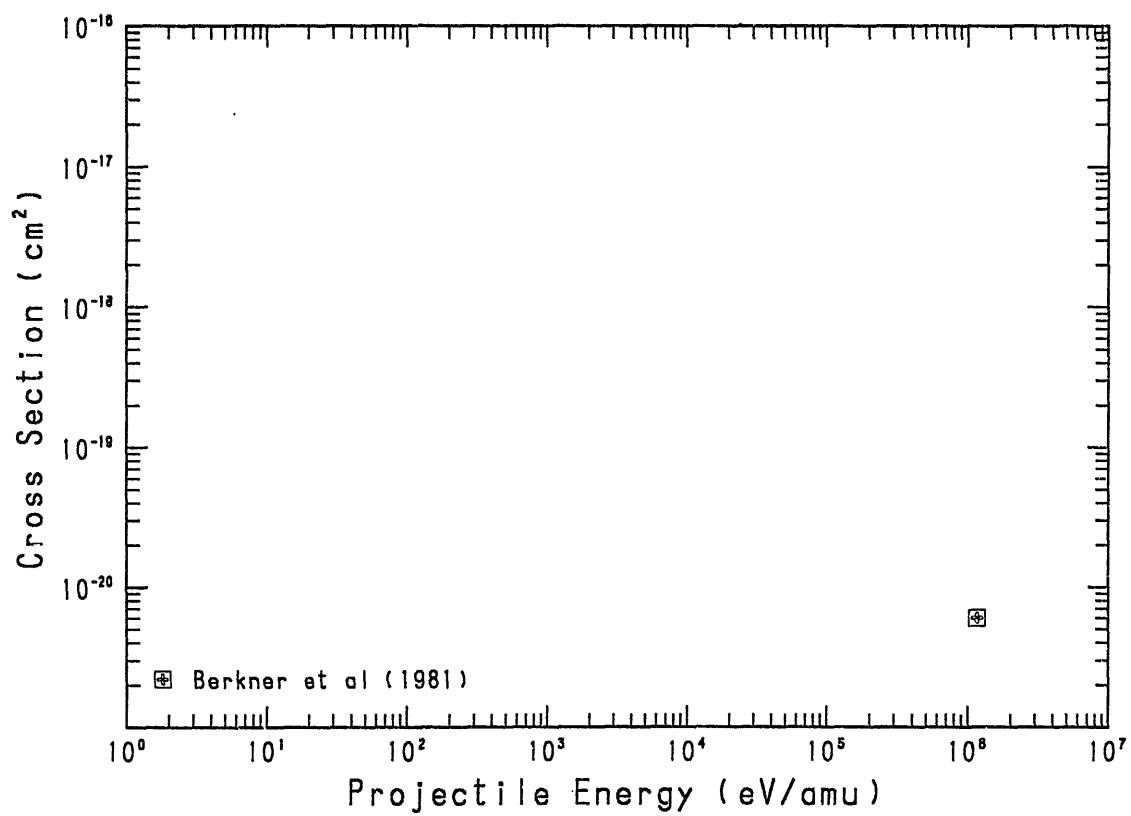


Fig.111 $\text{Fe}^{16+} + \text{H}_2 \rightarrow \text{Fe}^{15+}$

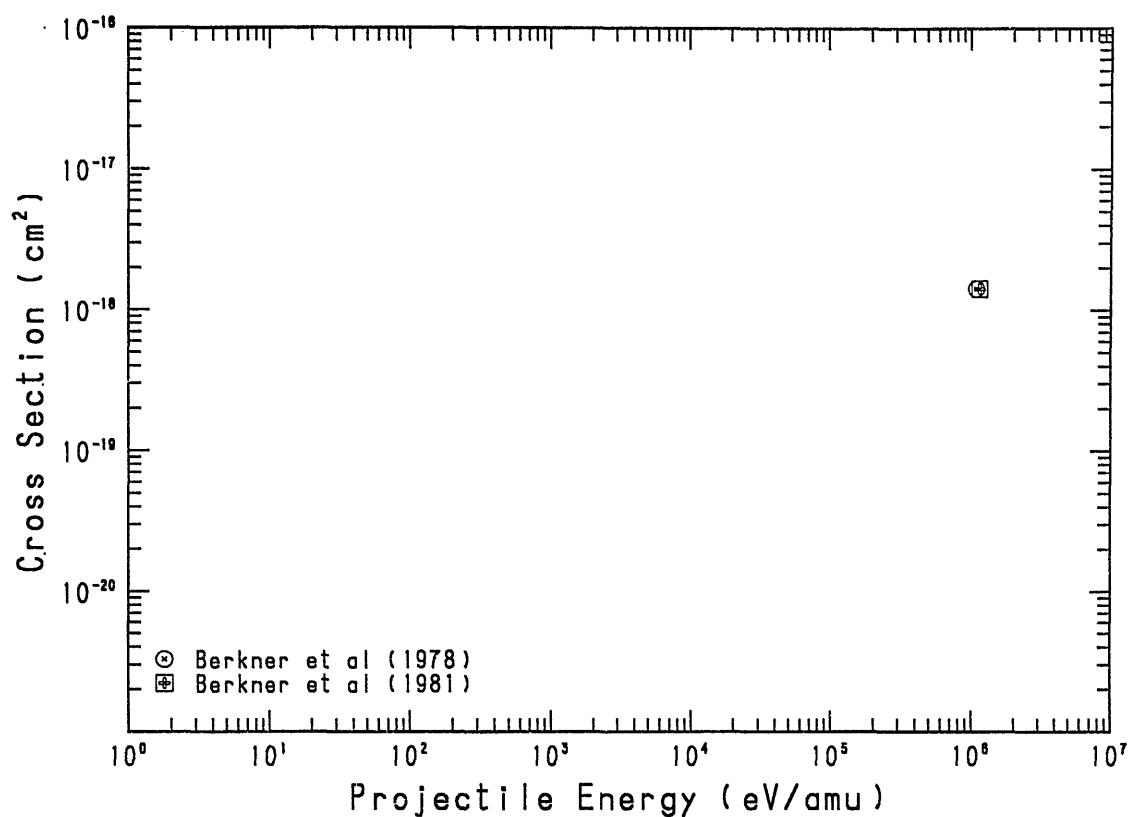


Fig.112 $\text{Fe}^{18+} + \text{H}_2 \rightarrow \text{Fe}^{16+}$

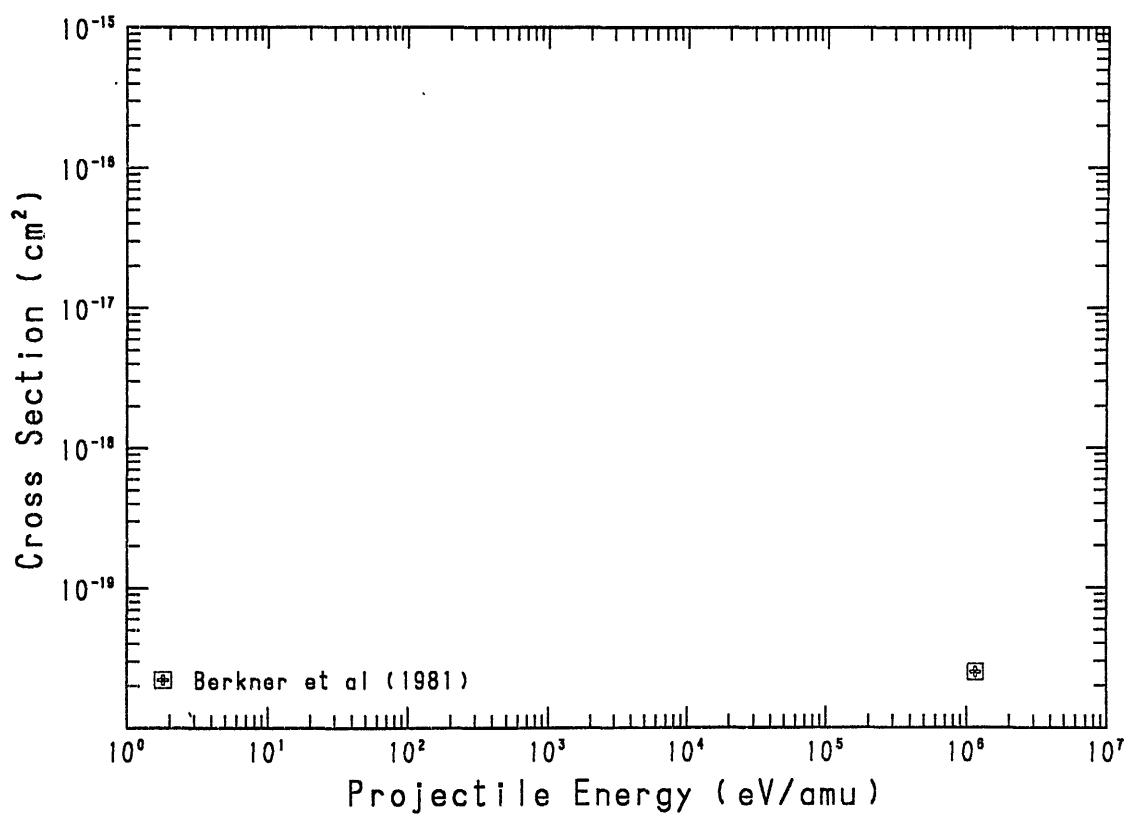


Fig.113 $\text{Fe}^{18+} + \text{H}_2 \rightarrow \text{Fe}^{17+}$

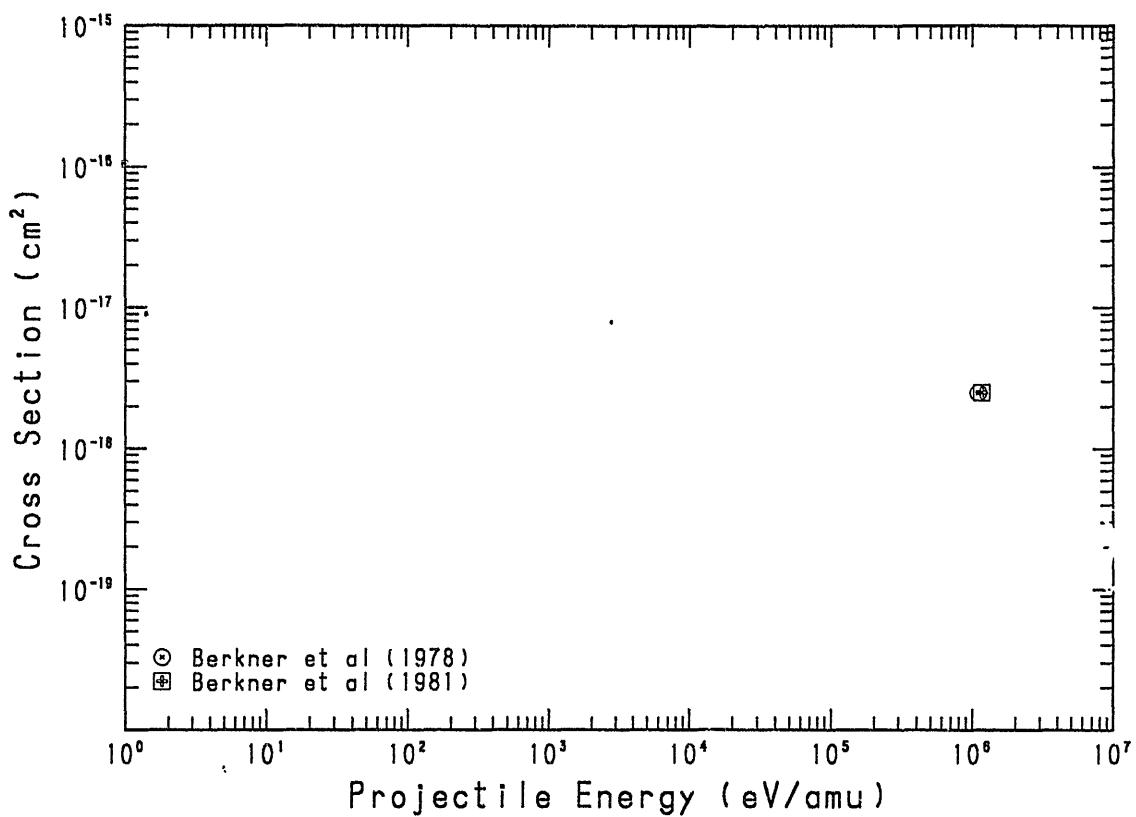


Fig.114 $\text{Fe}^{20+} + \text{H}_2 \rightarrow \text{Fe}^{18+}$

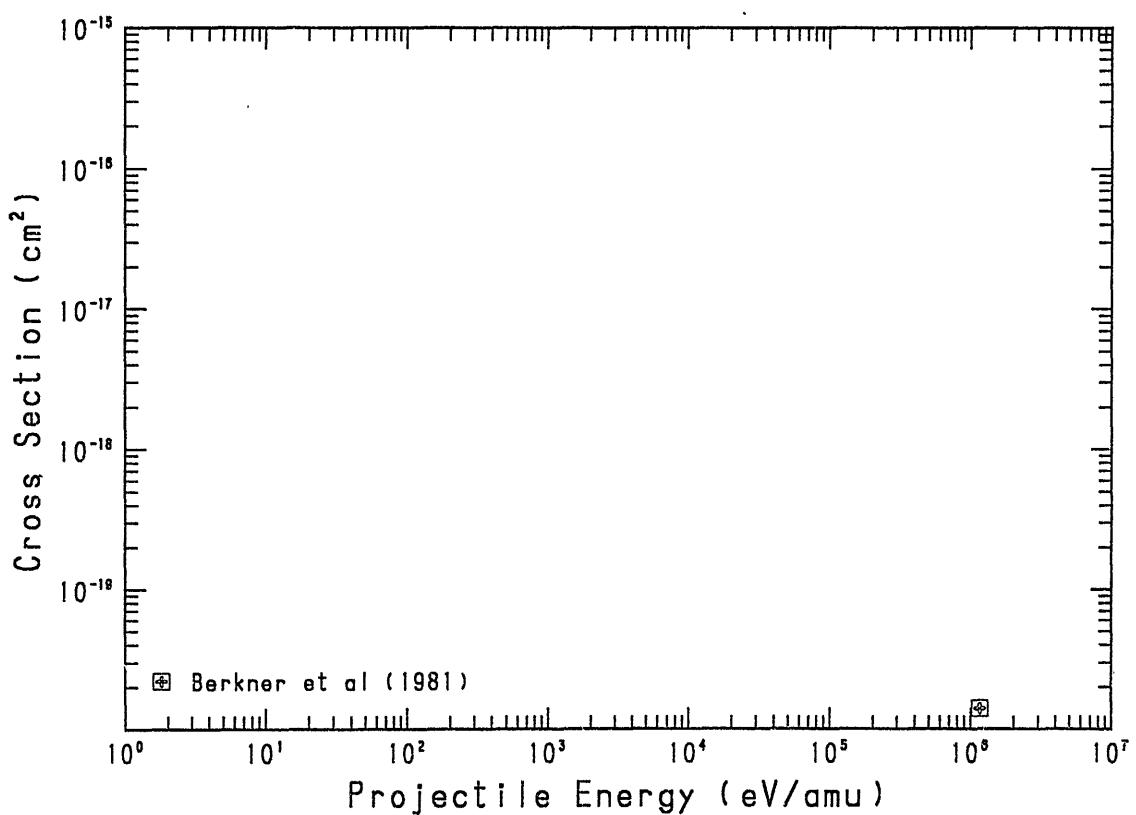


Fig. 115 $\text{Fe}^{20+} + \text{H}_2 \rightarrow \text{Fe}^{19+}$

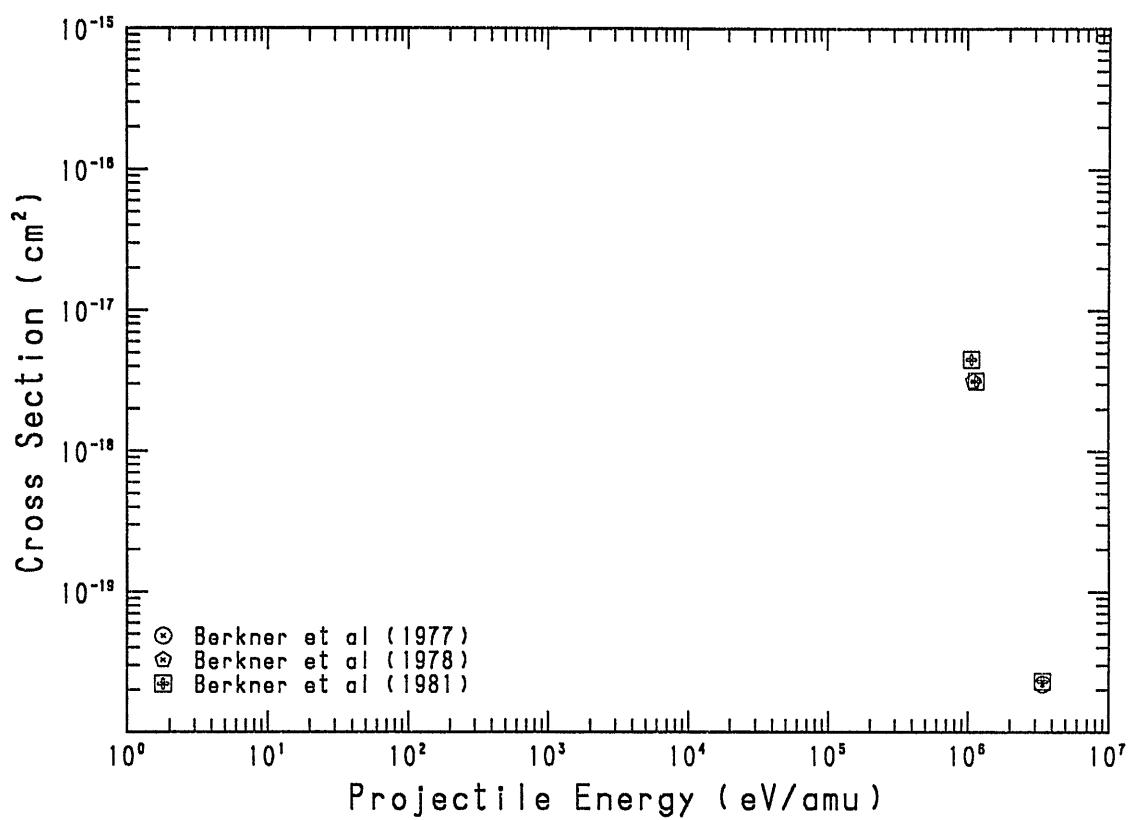


Fig. 116 $\text{Fe}^{21+} + \text{H}_2 \rightarrow \text{Fe}^{19+}$

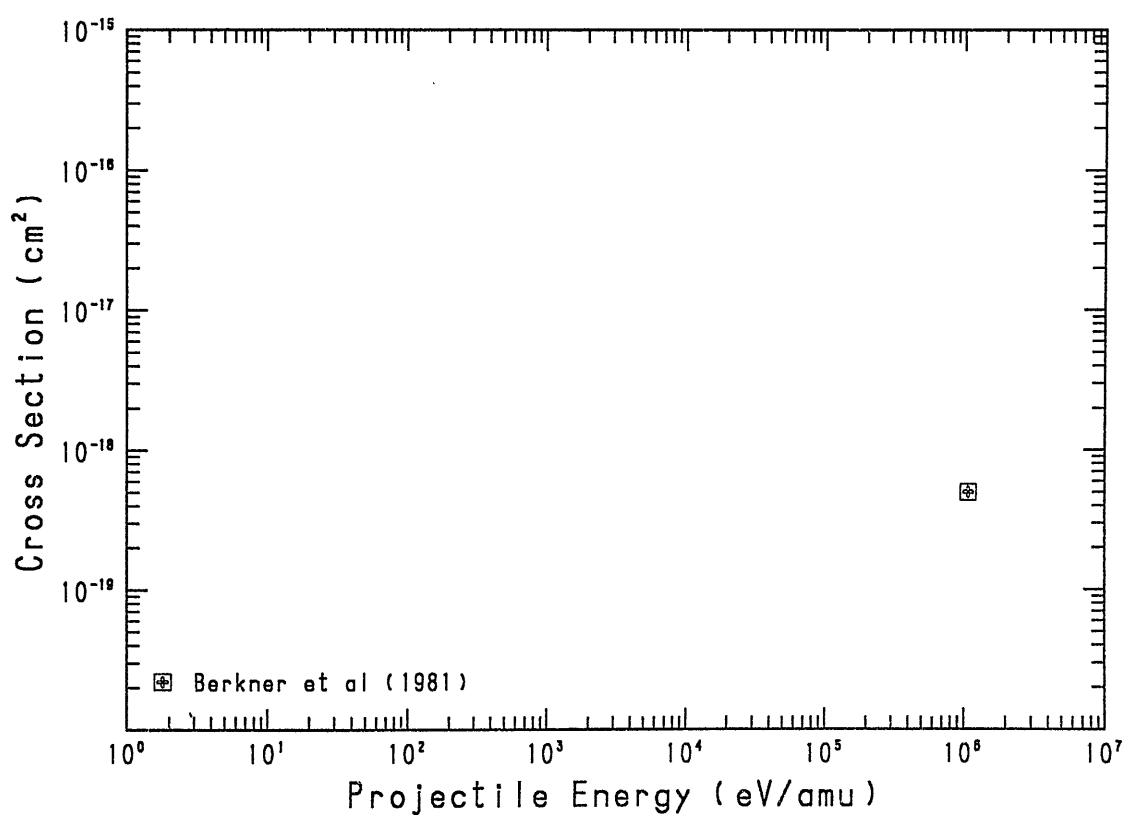


Fig.117 $\text{Fe}^{21+} + \text{H}_2 \rightarrow \text{Fe}^{20+}$

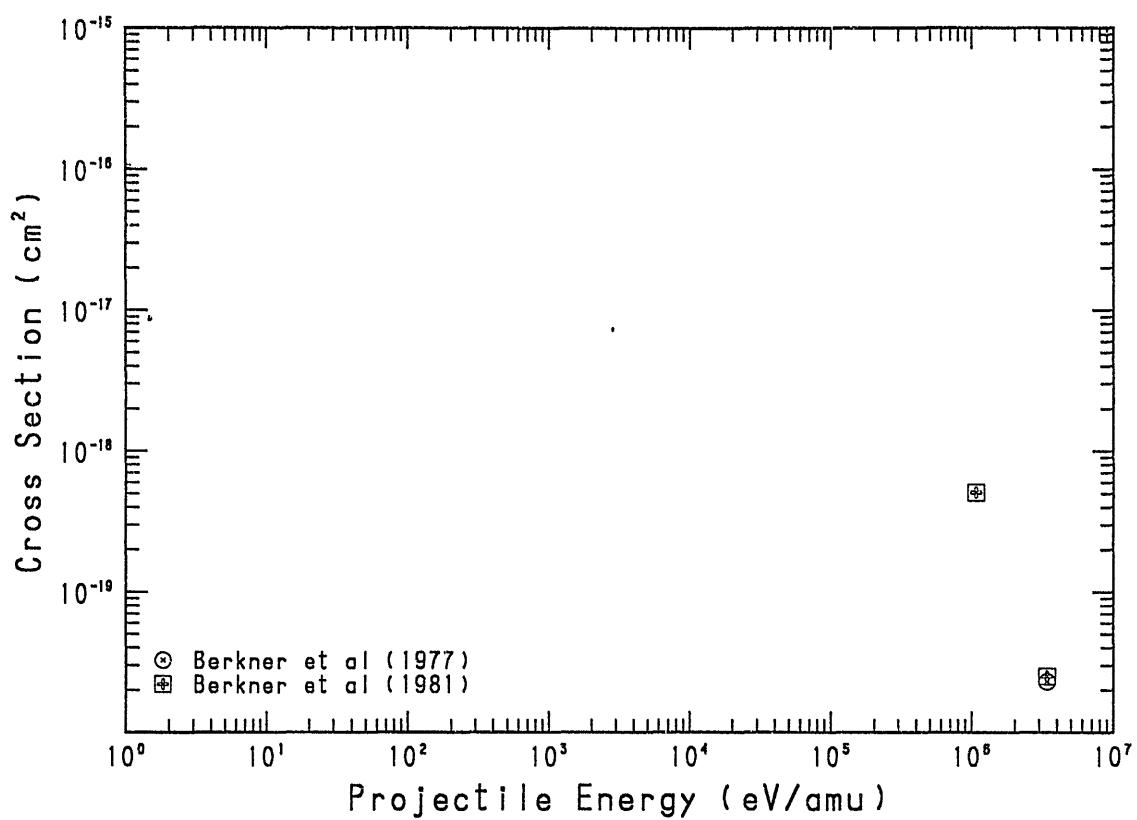


Fig.118 $\text{Fe}^{22+} + \text{H}_2 \rightarrow \text{Fe}^{20+}$

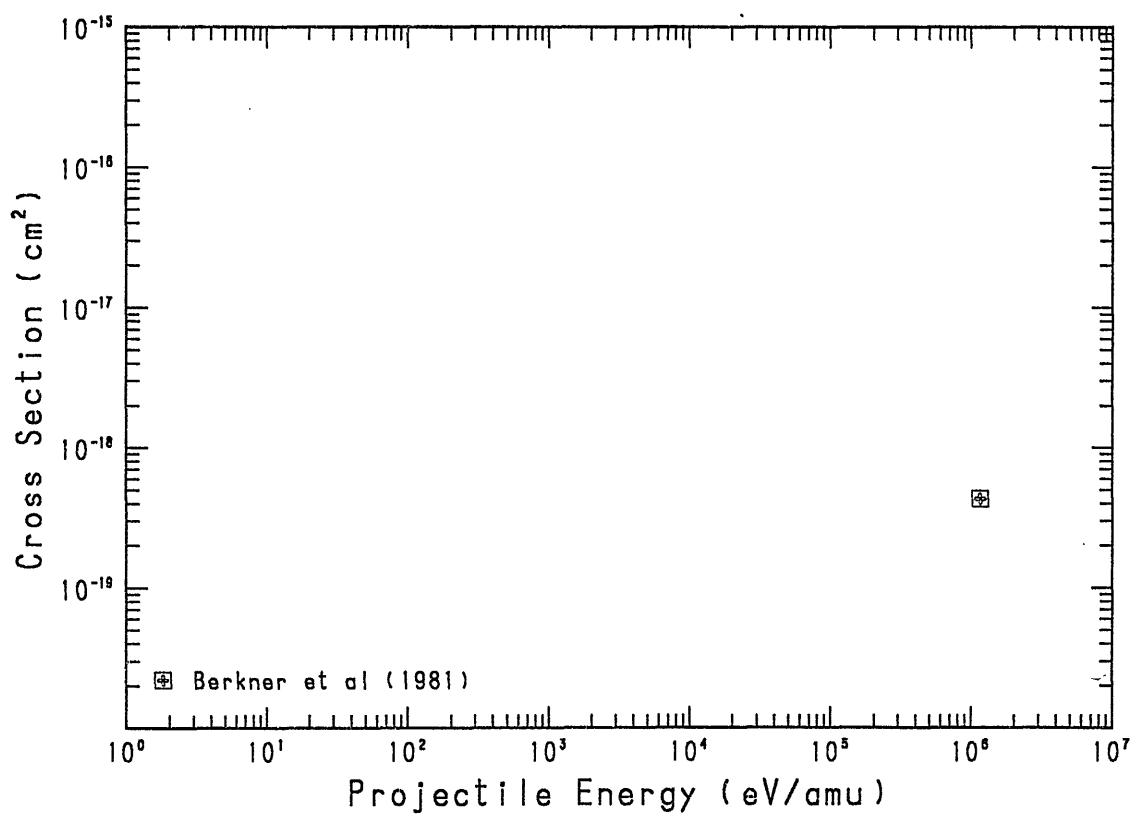


Fig. 119 $\text{Fe}^{22+} + \text{H}_2 \rightarrow \text{Fe}^{21+}$

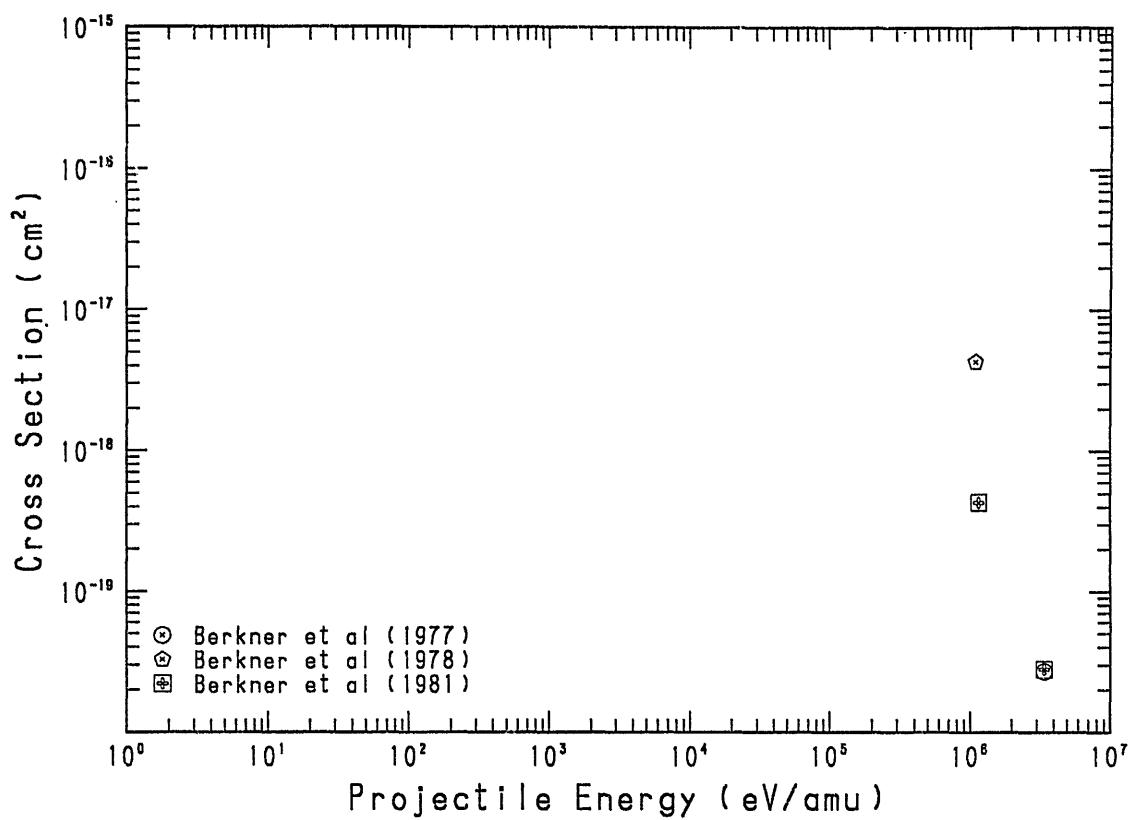


Fig. 120 $\text{Fe}^{23+} + \text{H}_2 \rightarrow \text{Fe}^{22+}$

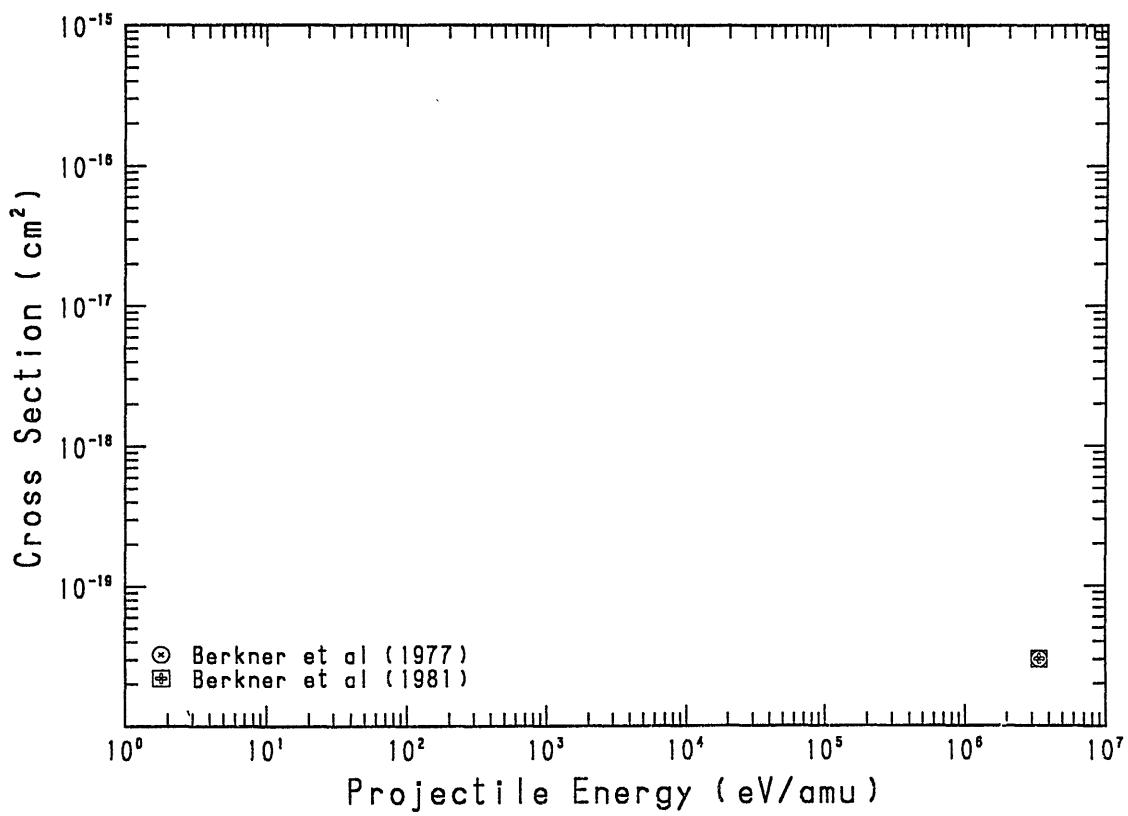


Fig.121 $\text{Fe}^{24+} + \text{H}_2 \rightarrow \text{Fe}^{23+}$

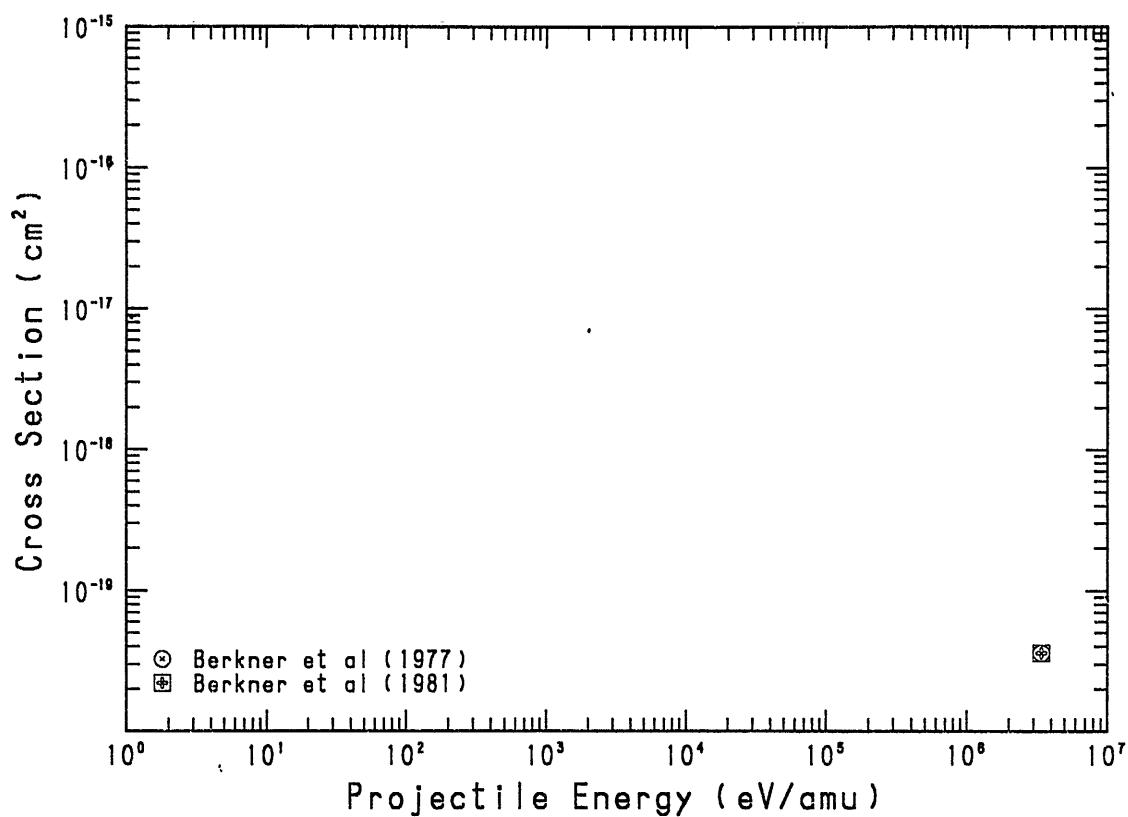


Fig.122 $\text{Fe}^{25+} + \text{H}_2 \rightarrow \text{Fe}^{24+}$

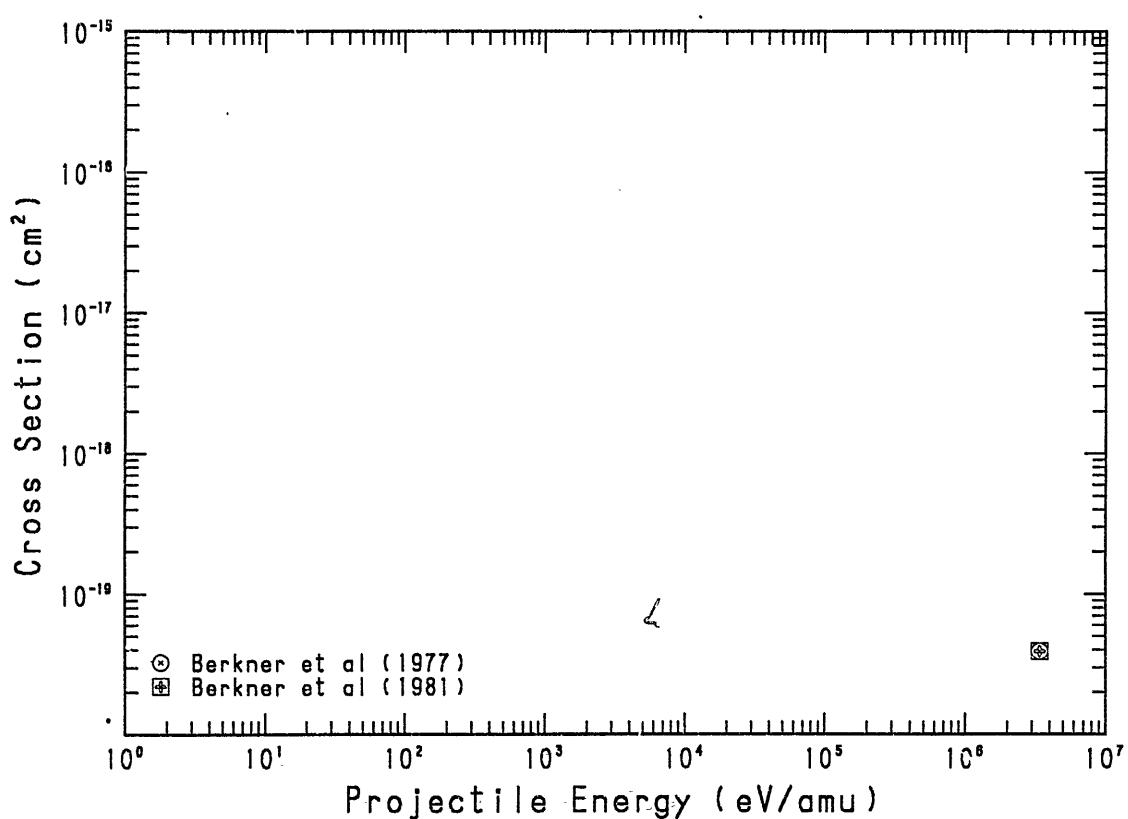


Fig. 123 $\text{Zn}^{2+} + \text{H}_2 \rightarrow \text{Zn}^+$

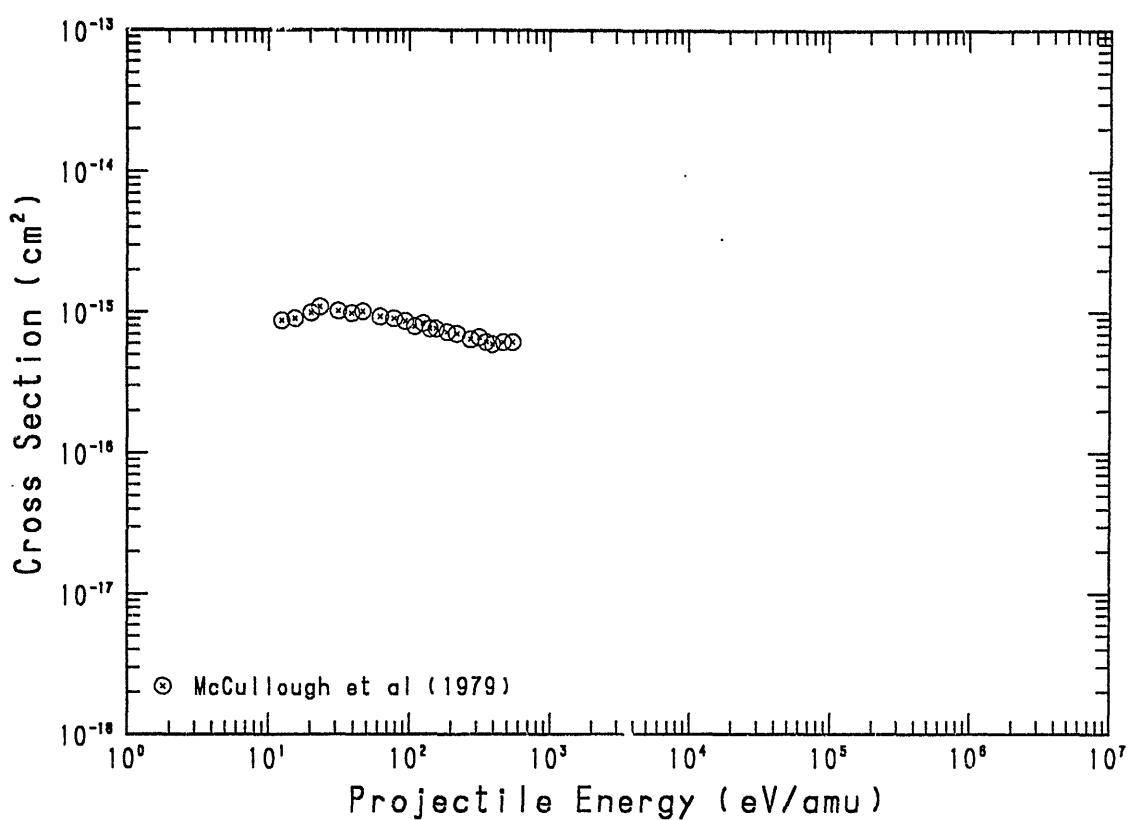


Fig. 124 $\text{Br}^{3+} + \text{H}_2 \rightarrow \text{Br}^{2+}$

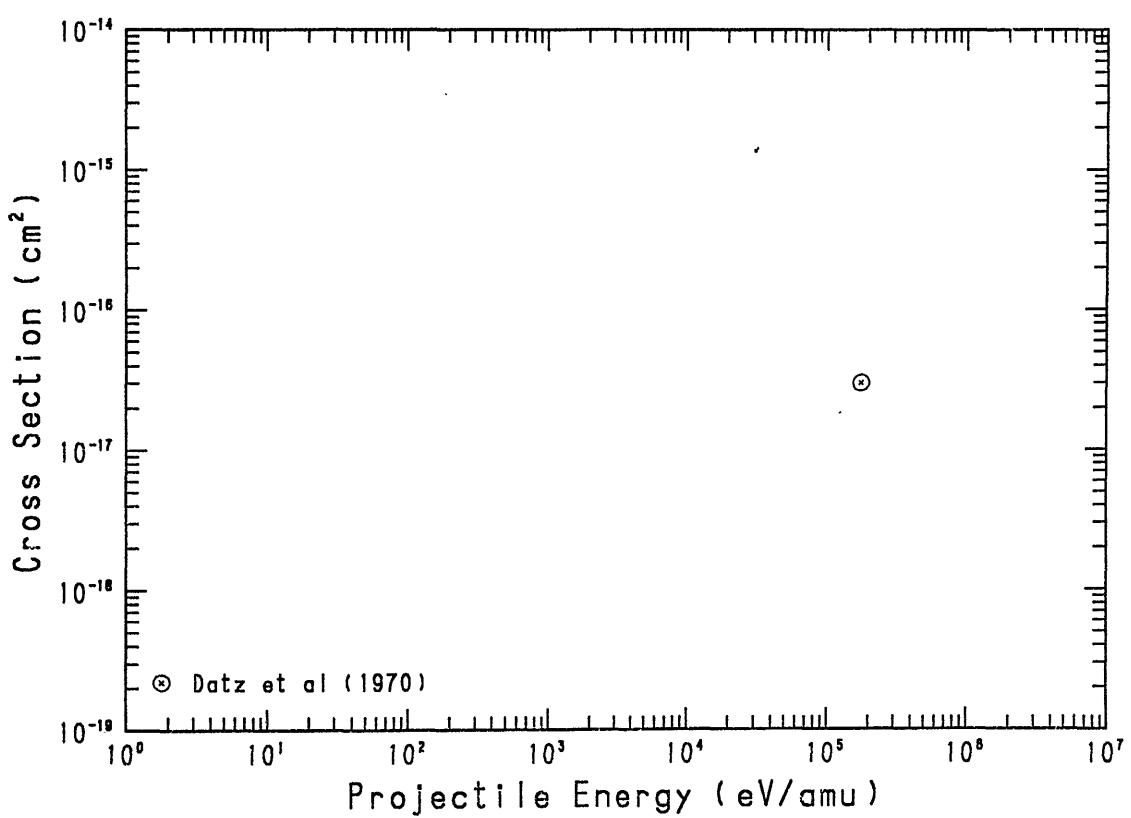


Fig. 125 $\text{Br}^{4+} + \text{H}_2 \rightarrow \text{Br}^{3+}$

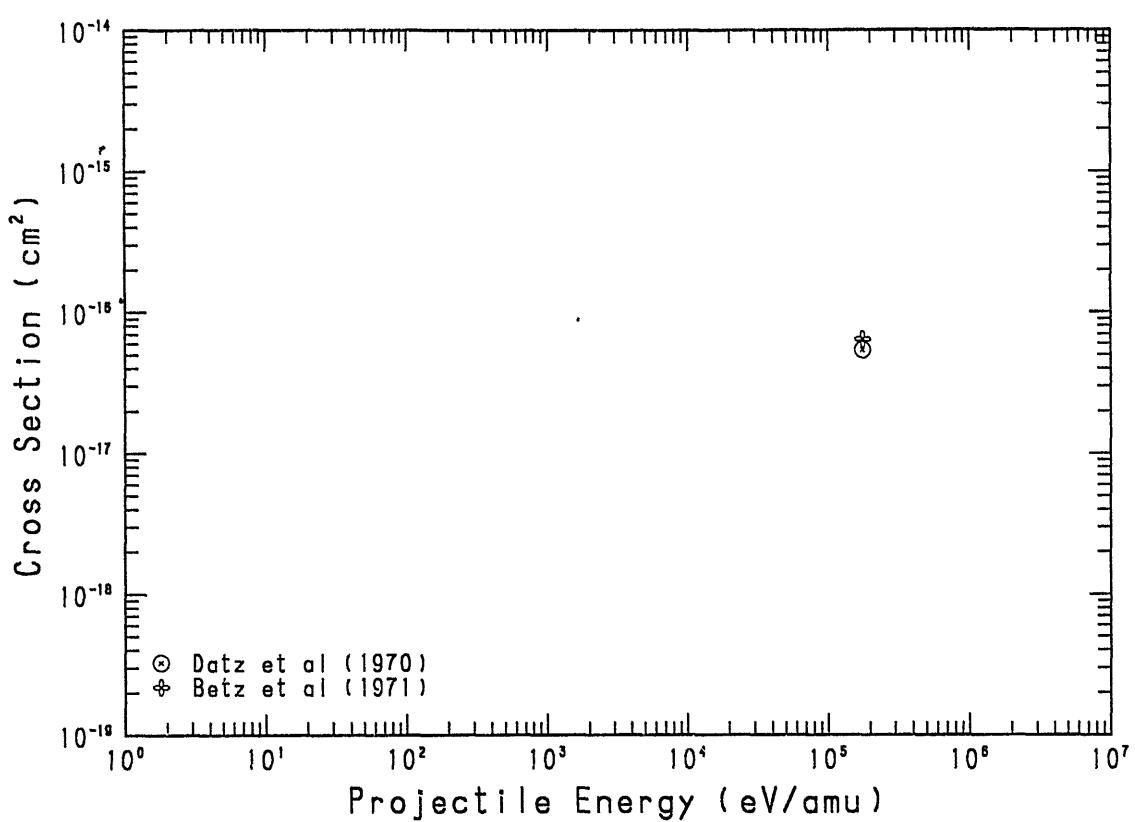


Fig. 126 $\text{Br}^{5+} + \text{H}_2 \rightarrow \text{Br}^{4+}$

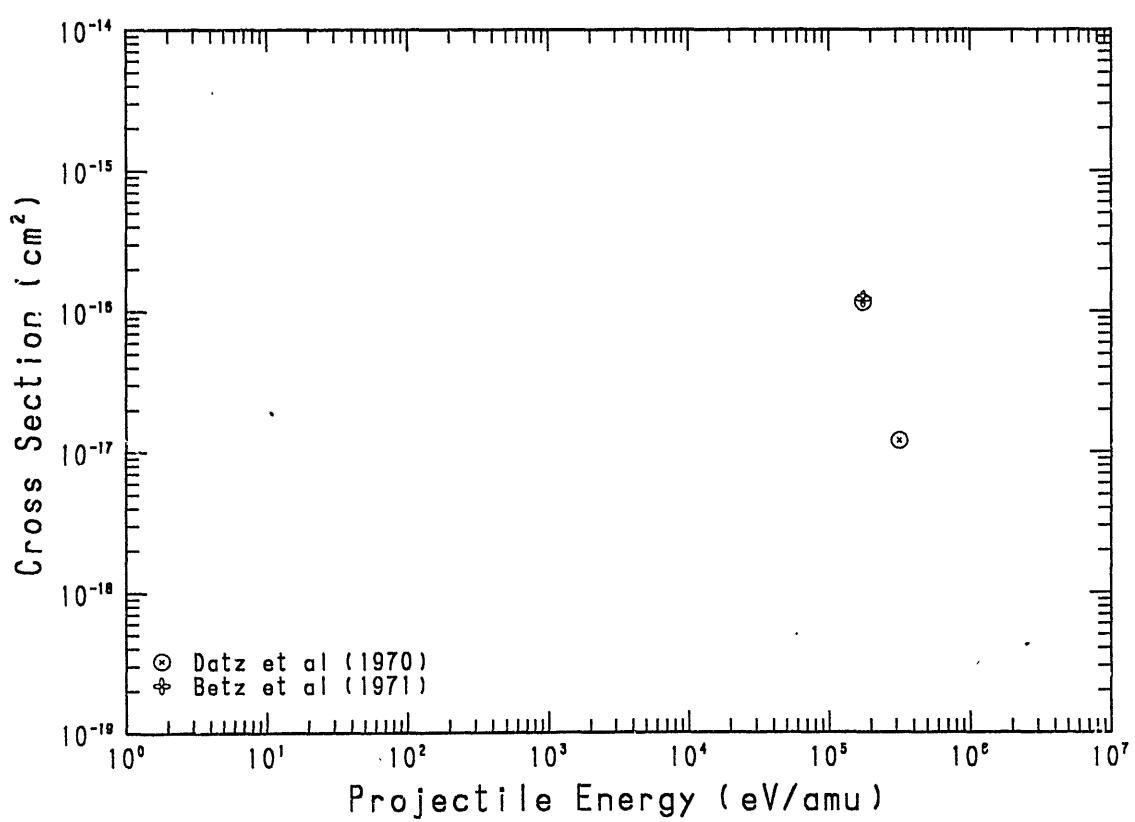


Fig. 127 $\text{Br}^{6+} + \text{H}_2 \rightarrow \text{Br}^{4+}$

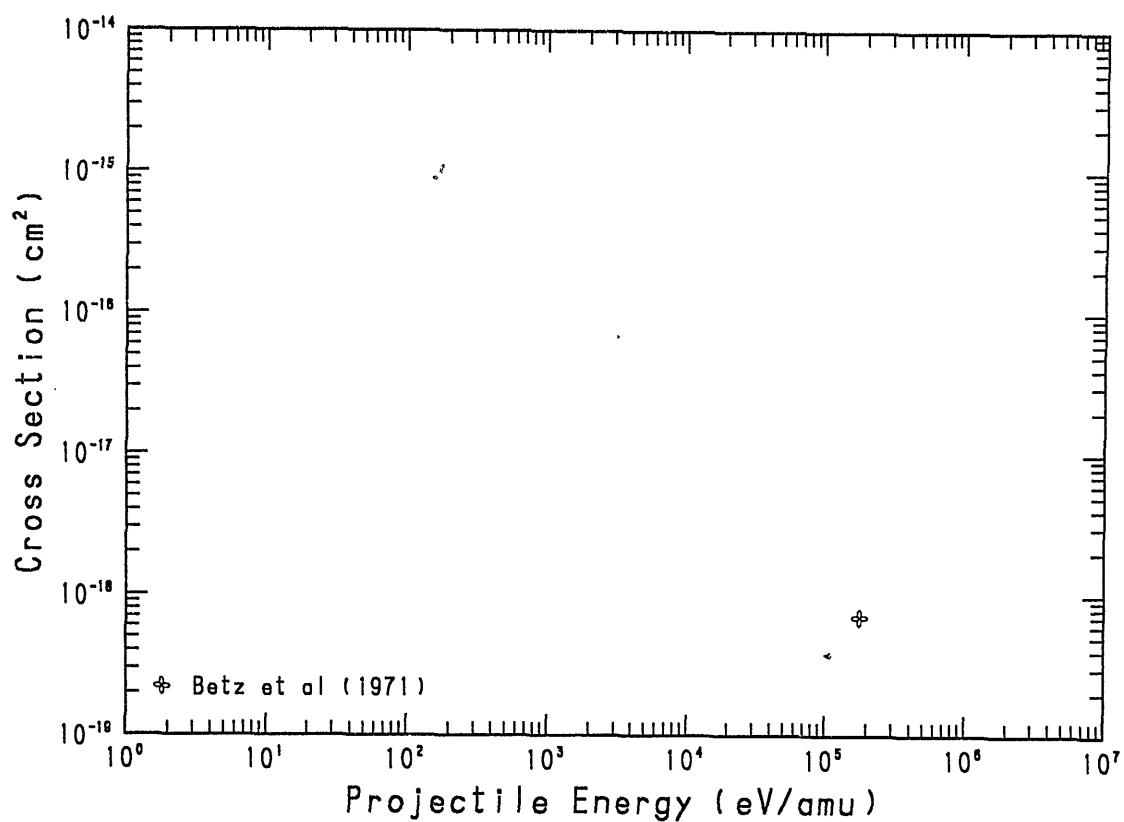


Fig. 128 $\text{Br}^{6+} + \text{H}_2 \rightarrow \text{Br}^{5+}$

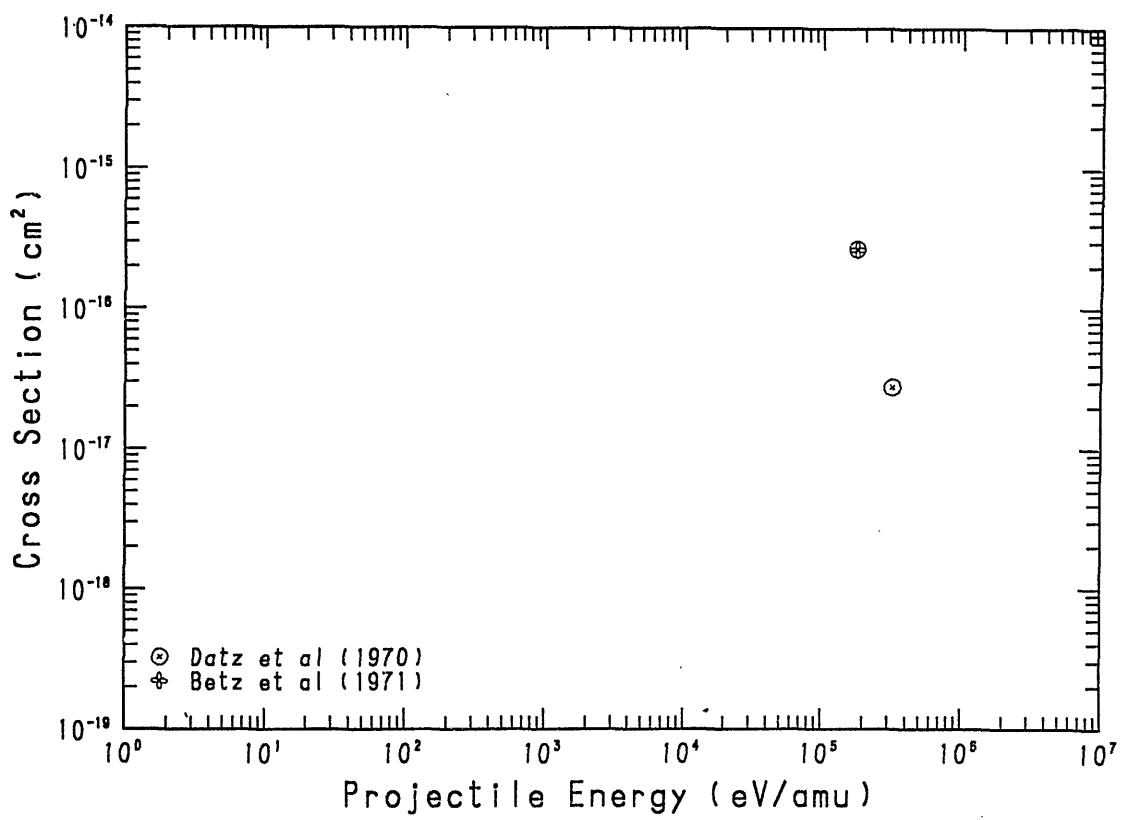


Fig. 129 $\text{Br}^{7+} + \text{H}_2 \rightarrow \text{Br}^{5+}$

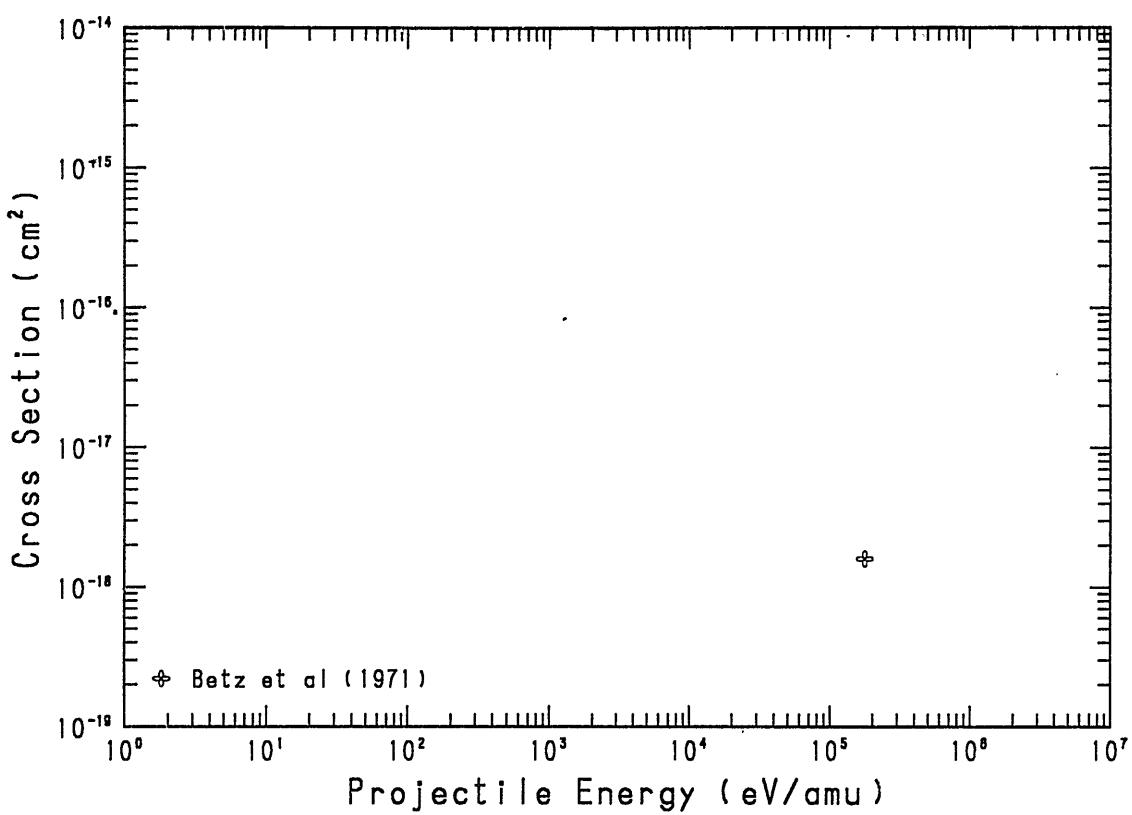


Fig. 130 $\text{Br}^{7+} + \text{H}_2 \rightarrow \text{Br}^{6+}$

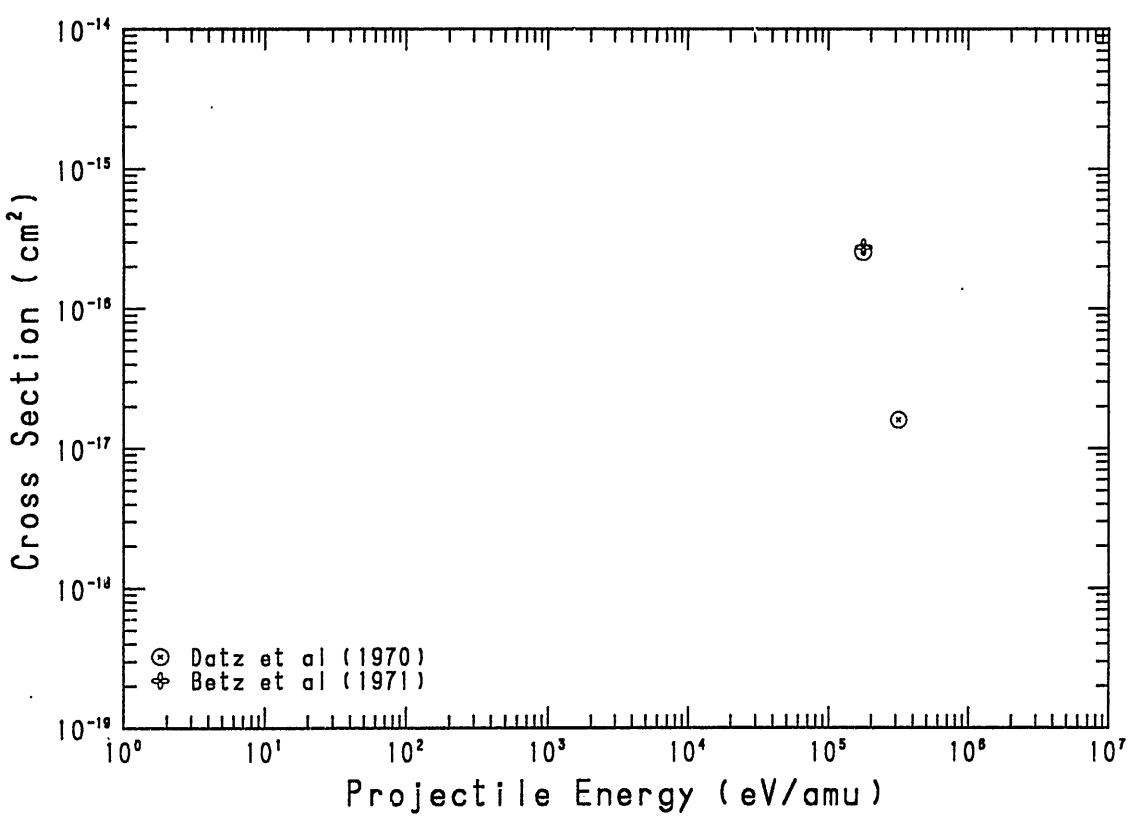


Fig. 131 $\text{Br}^{8+} + \text{H}_2 \rightarrow \text{Br}^{6+}$

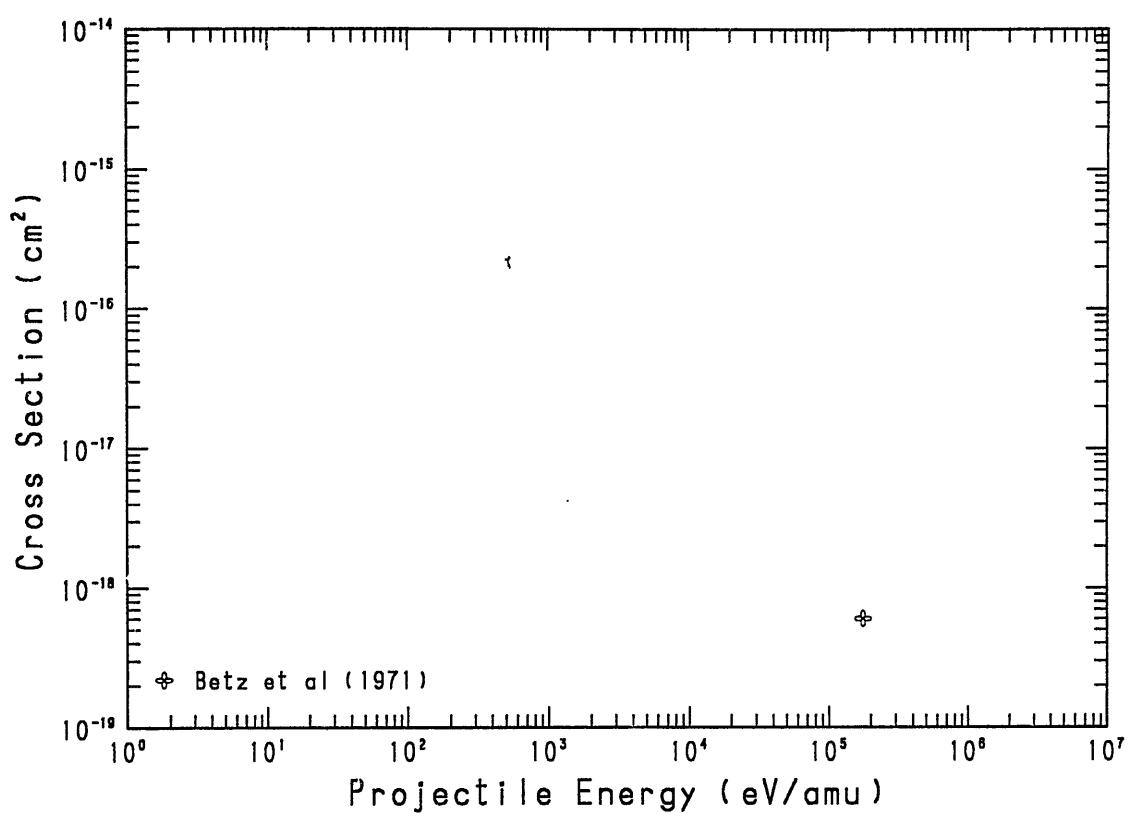


Fig. 132 $\text{Br}^{8+} + \text{H}_2 \rightarrow \text{Br}^{7+}$

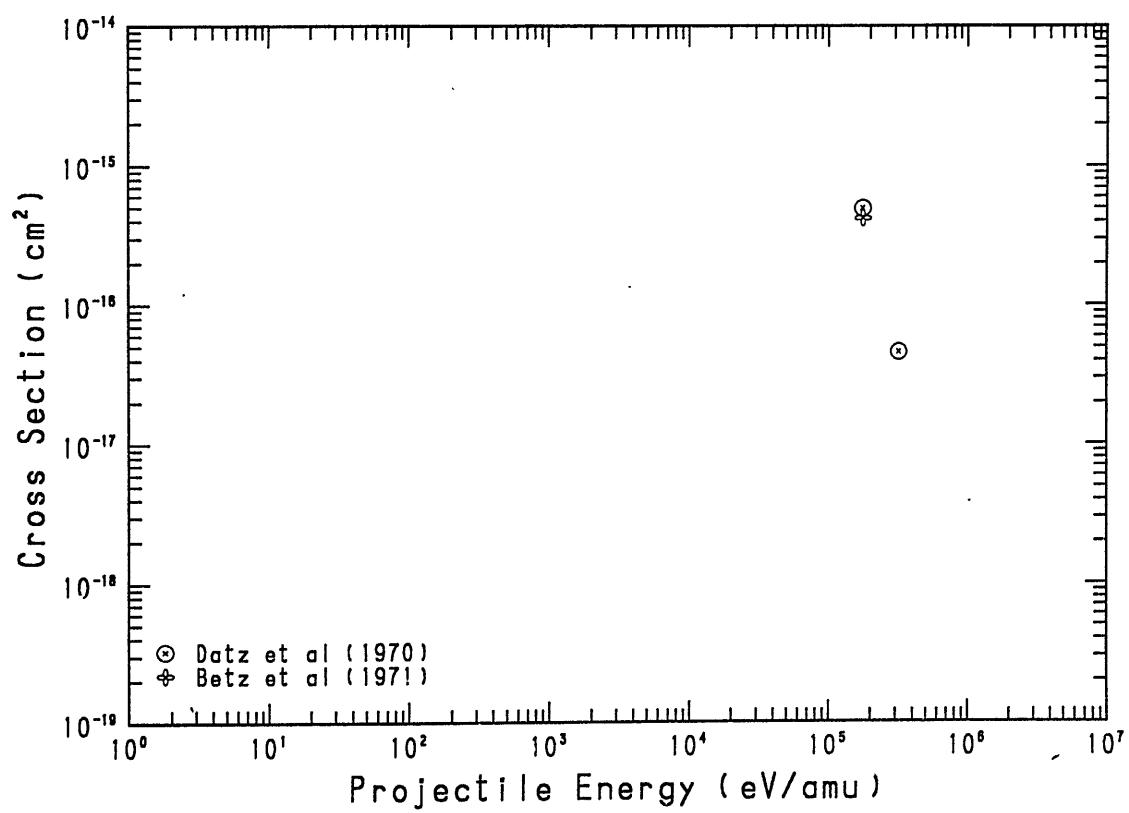


Fig. 133 $\text{Br}^{9+} + \text{H}_2 \rightarrow \text{Br}^{8+}$

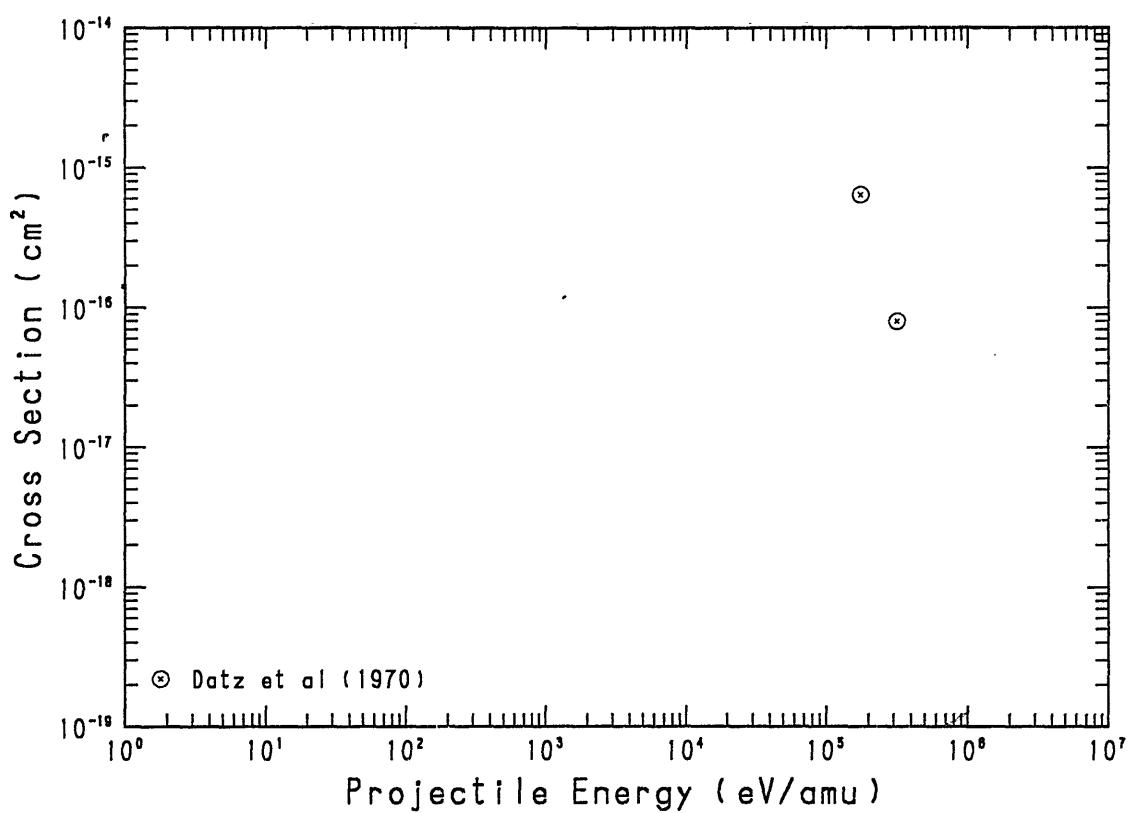


Fig. 134 $\text{Br}^{10+} + \text{H}_2 \rightarrow \text{Br}^{9+}$

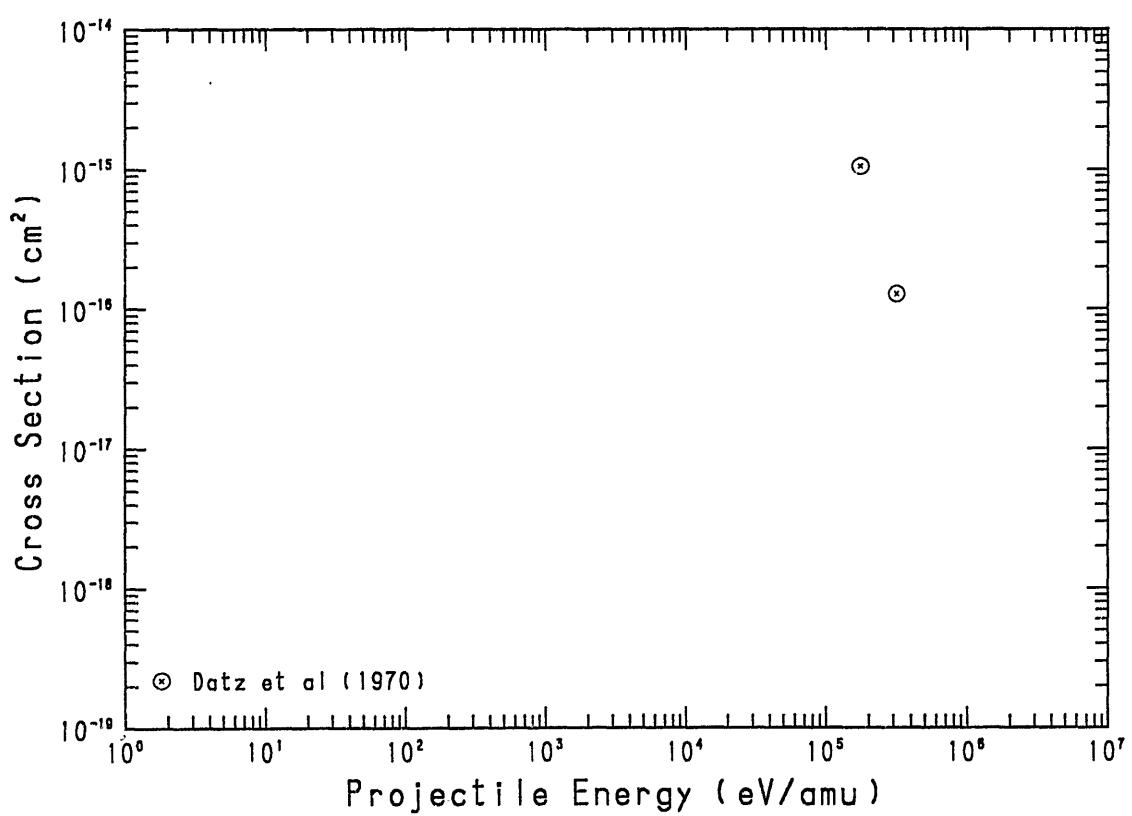


Fig.135 $\text{Br}^{11+} + \text{H}_2 \rightarrow \text{Br}^{10+}$

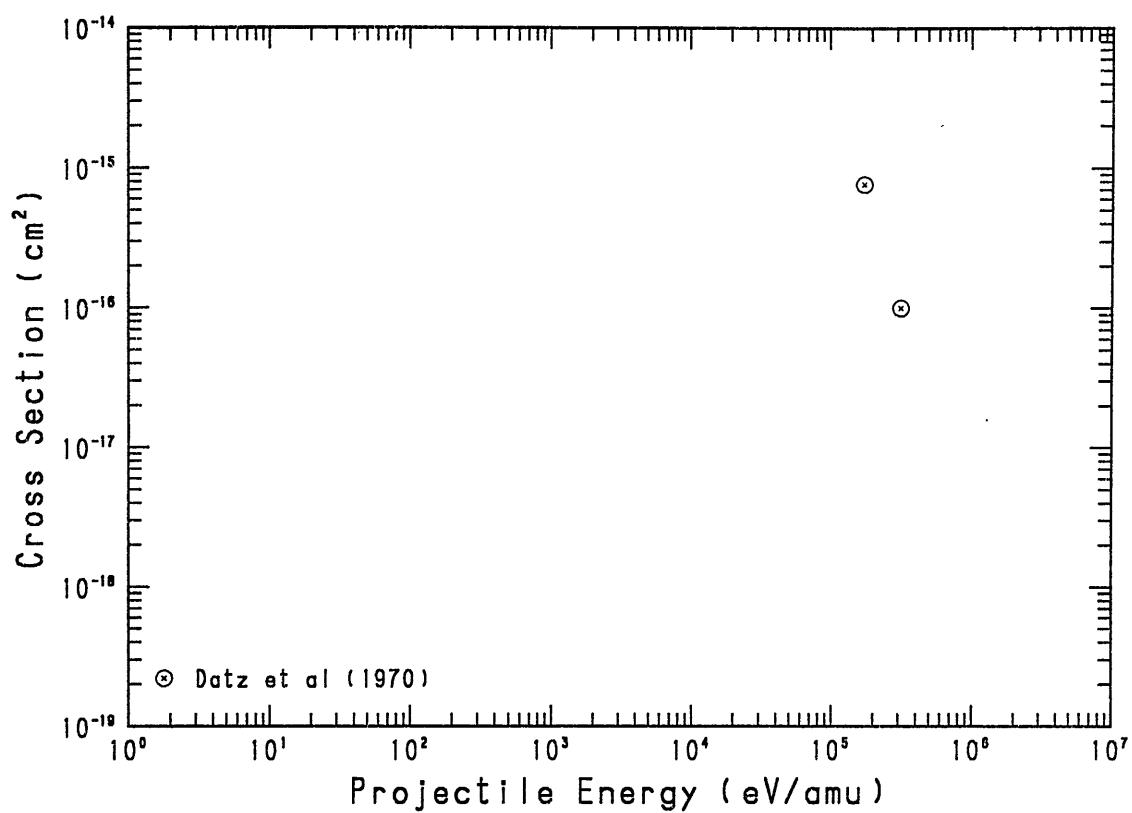


Fig.136 $\text{Br}^{12+} + \text{H}_2 \rightarrow \text{Br}^{11+}$

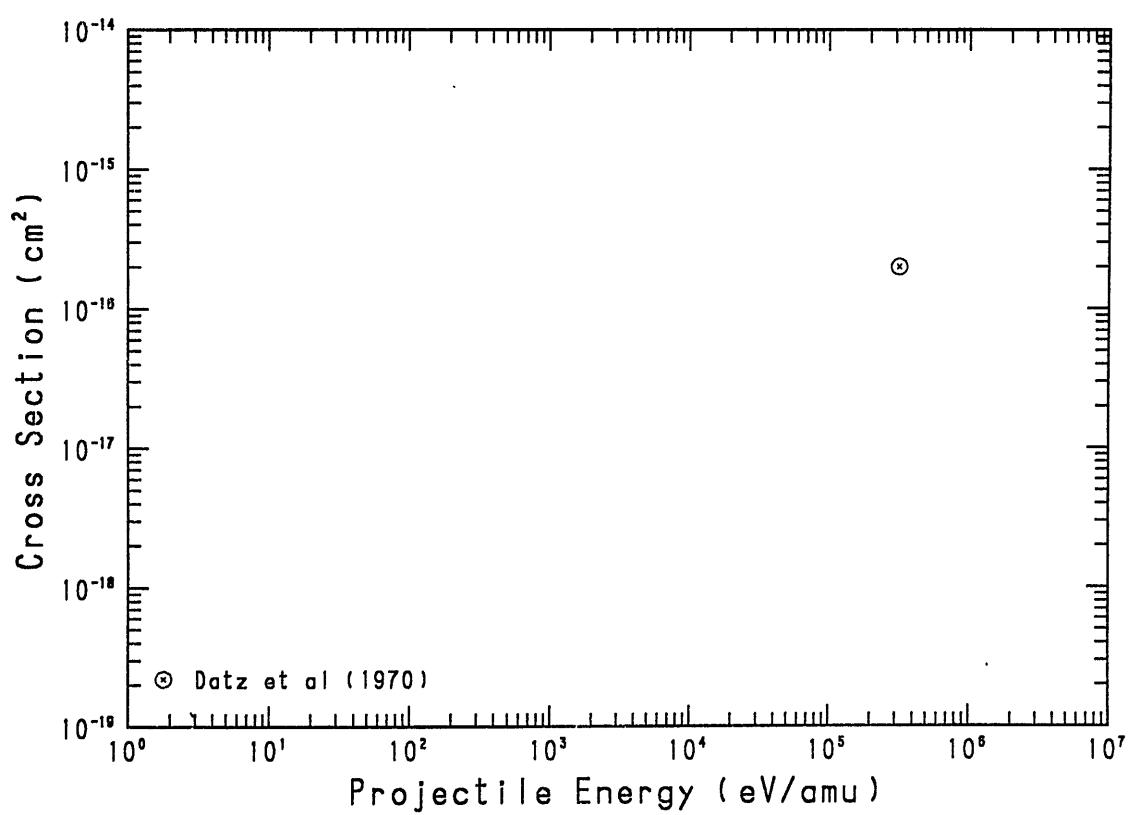


Fig.137 $\text{Kr}^{2+} + \text{H}_2 \rightarrow \text{Kr}^+$

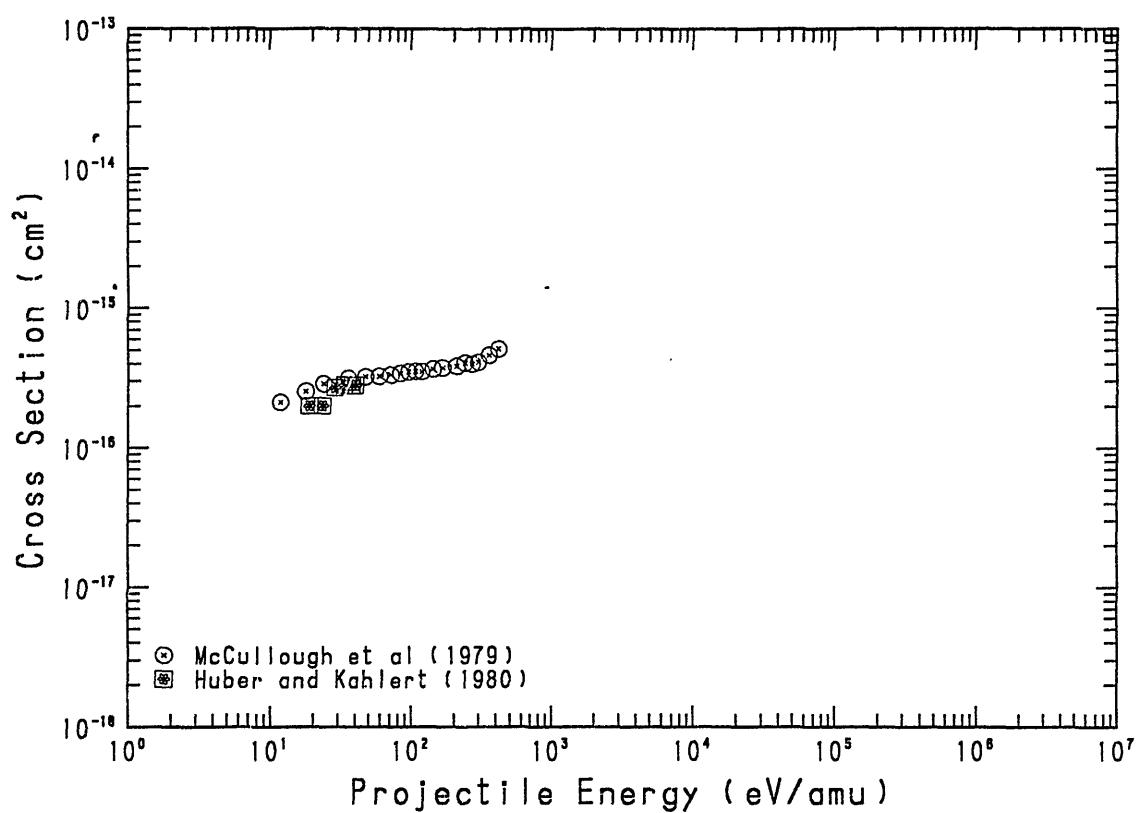


Fig.138 $\text{Kr}^{3+} + \text{H}_2 \rightarrow \text{Kr}^+$

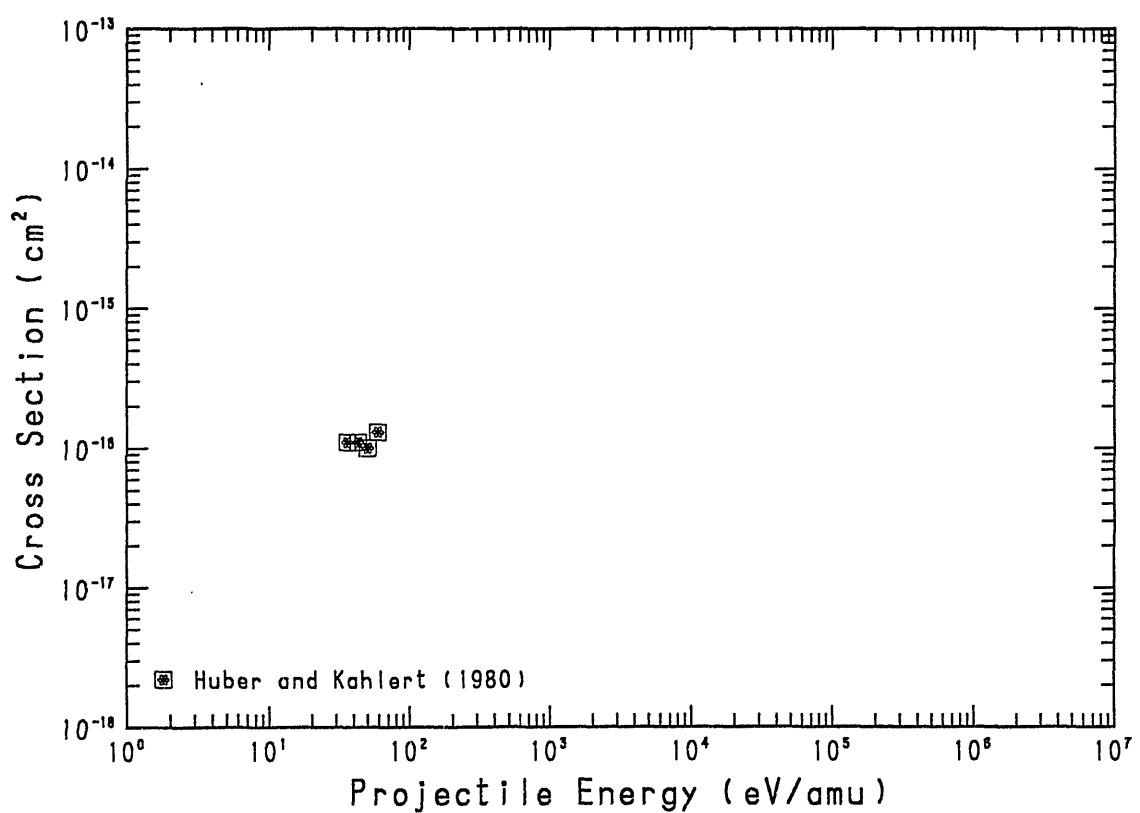


Fig. 139 $\text{Kr}^{3+} + \text{H}_2 \rightarrow \text{Kr}^{2+}$

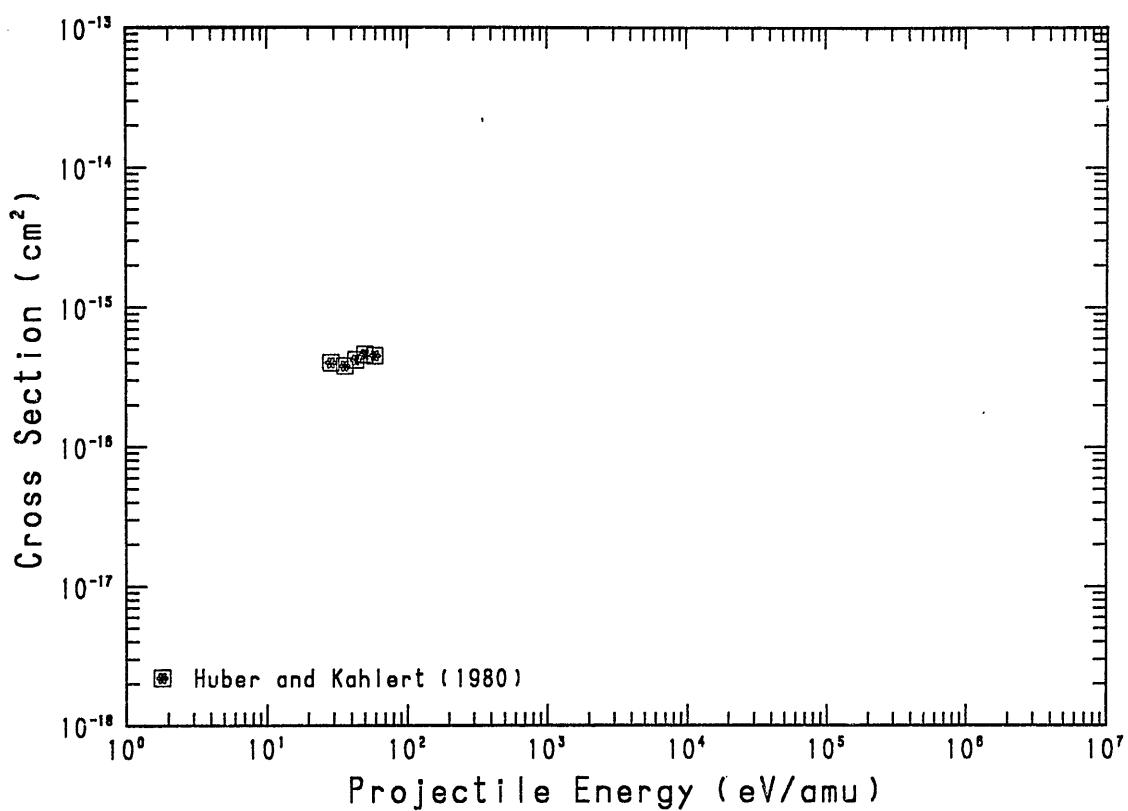


Fig. 140 $\text{Kr}^{4+} + \text{H}_2 \rightarrow \text{Kr}^{2+}$

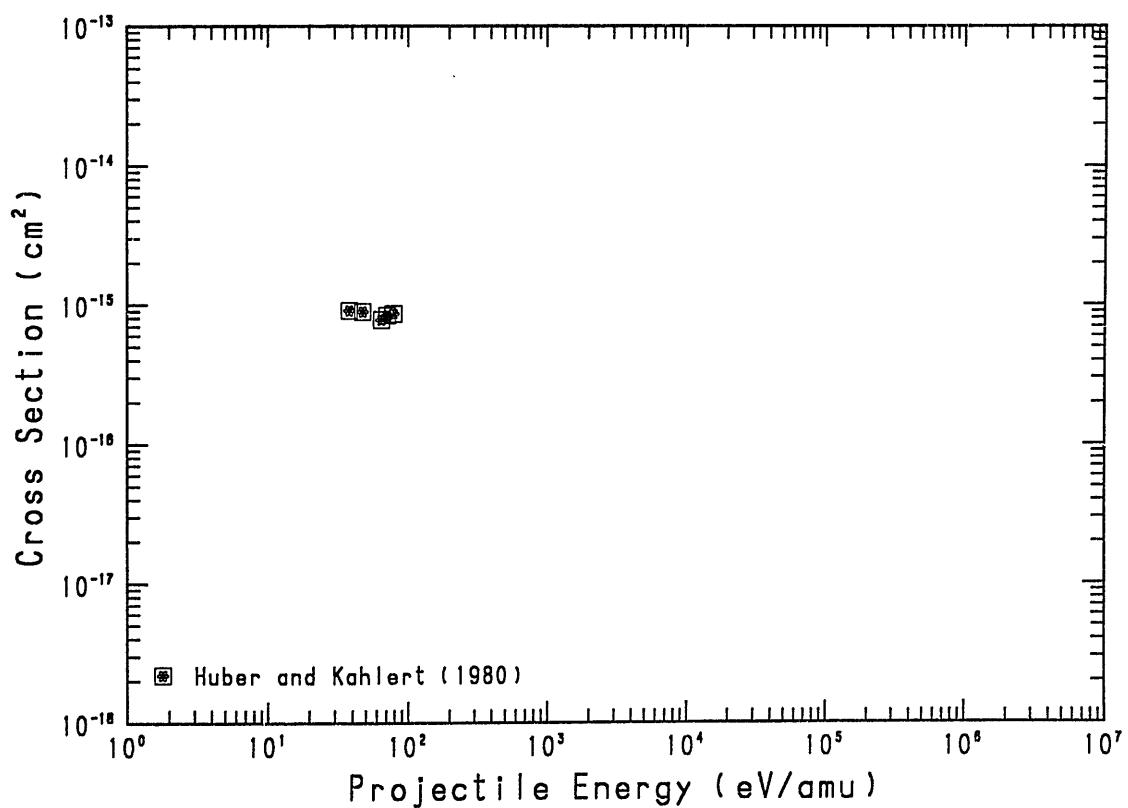


Fig.141 $\text{Kr}^{4+} + \text{H}_2 \rightarrow \text{Kr}^{3+}$

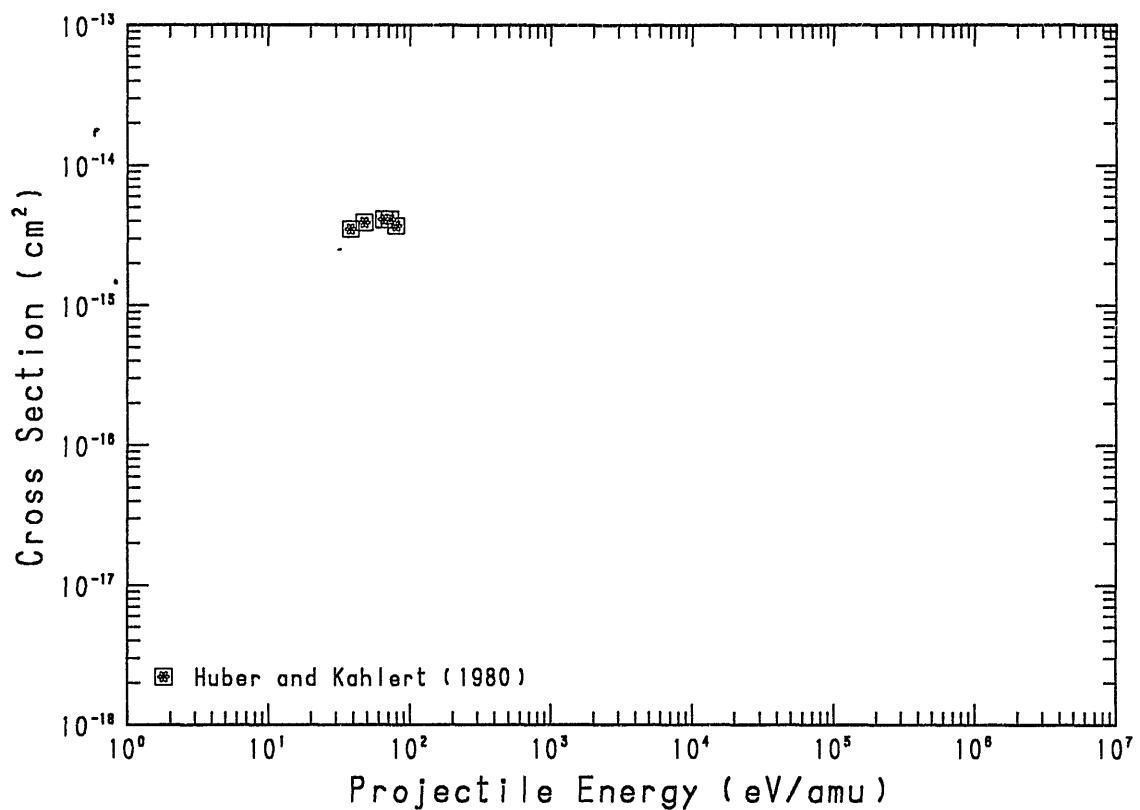


Fig.142 $\text{Kr}^{5+} + \text{H}_2 \rightarrow \text{Kr}^{3+}$

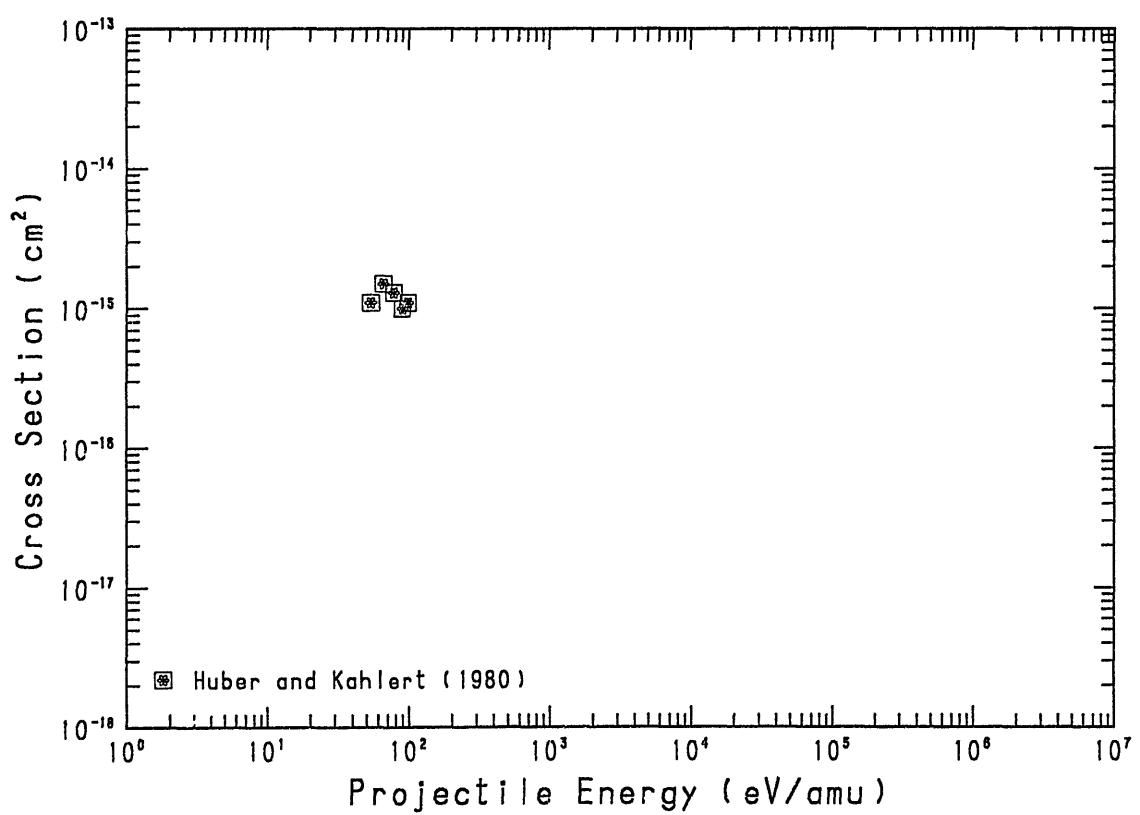


Fig. 143 $\text{Kr}^{5+} + \text{H}_2 \rightarrow \text{Kr}^{4+}$

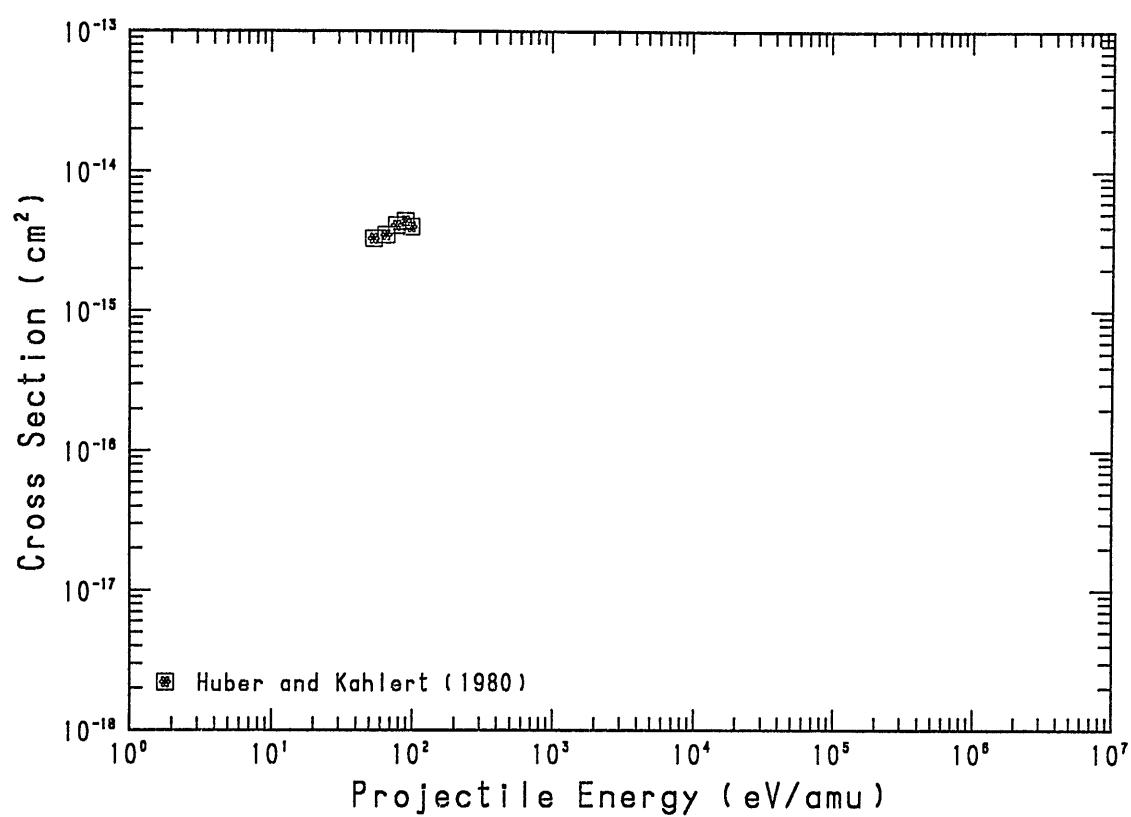


Fig. 144 $\text{Kr}^{8+} + \text{H}_2 \rightarrow \text{Kr}^{4+}$

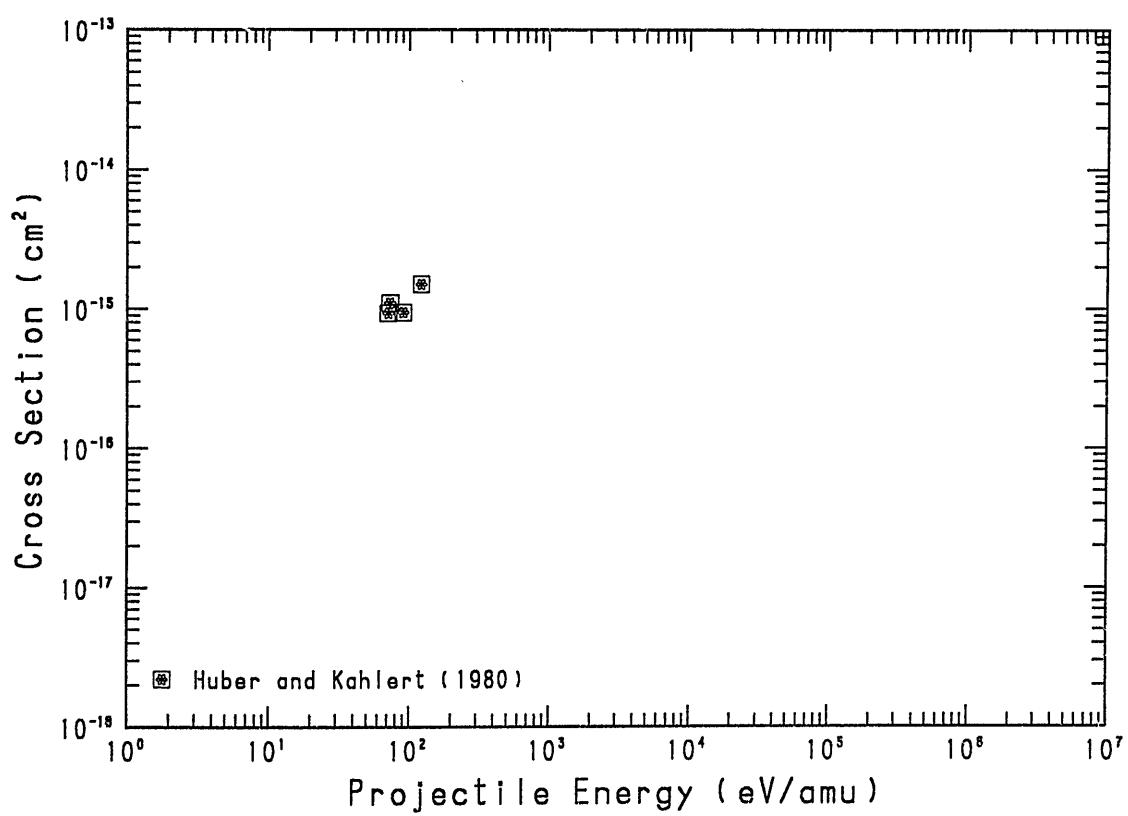


Fig.145 $\text{Kr}^{6+} + \text{H}_2 \rightarrow \text{Kr}^{5+}$

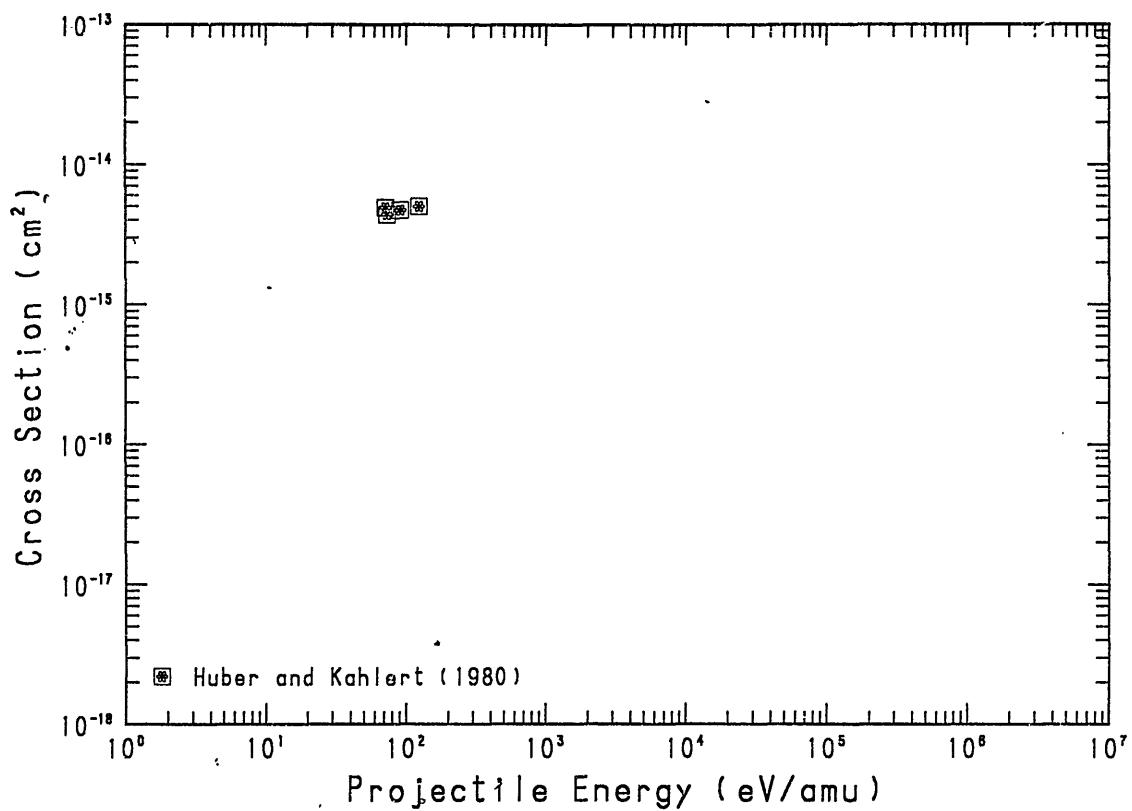


Fig.146 $\text{Kr}^{7+} + \text{H}_2 \rightarrow \text{Kr}^{5+}$

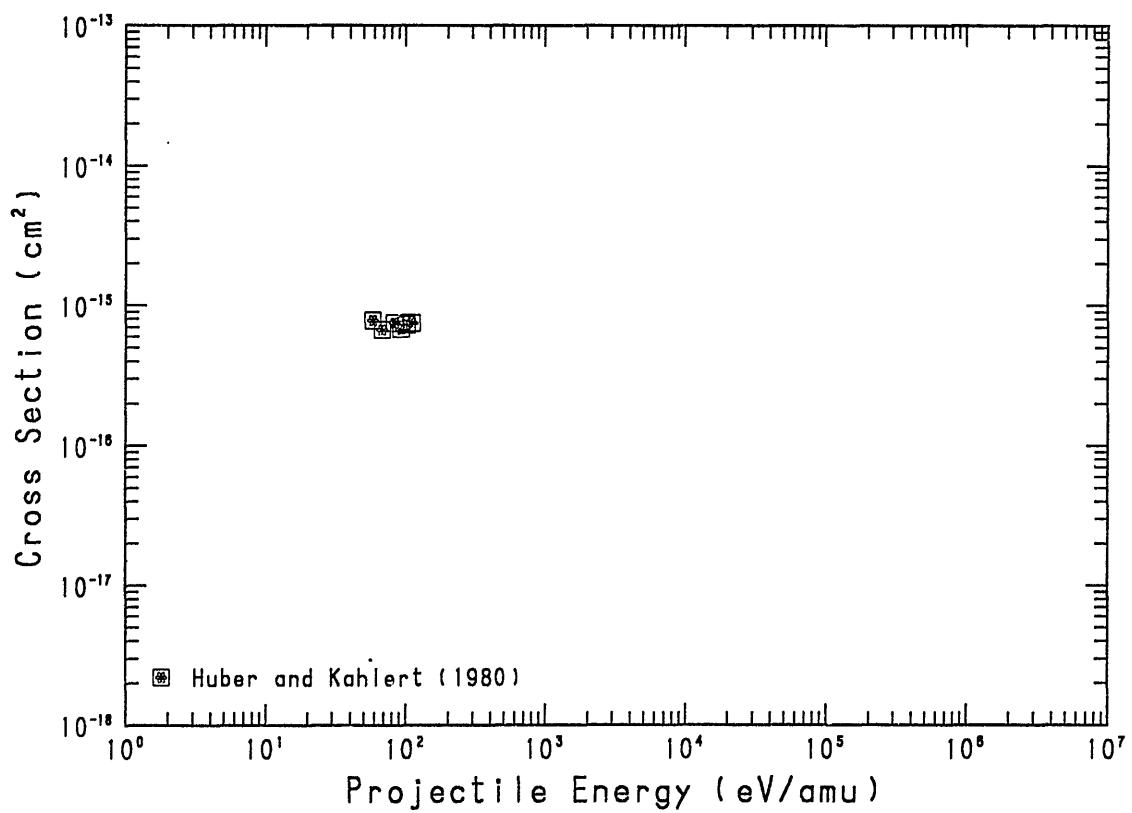


Fig.147 $\text{Kr}^{7+} + \text{H}_2 \rightarrow \text{Kr}^{6+}$

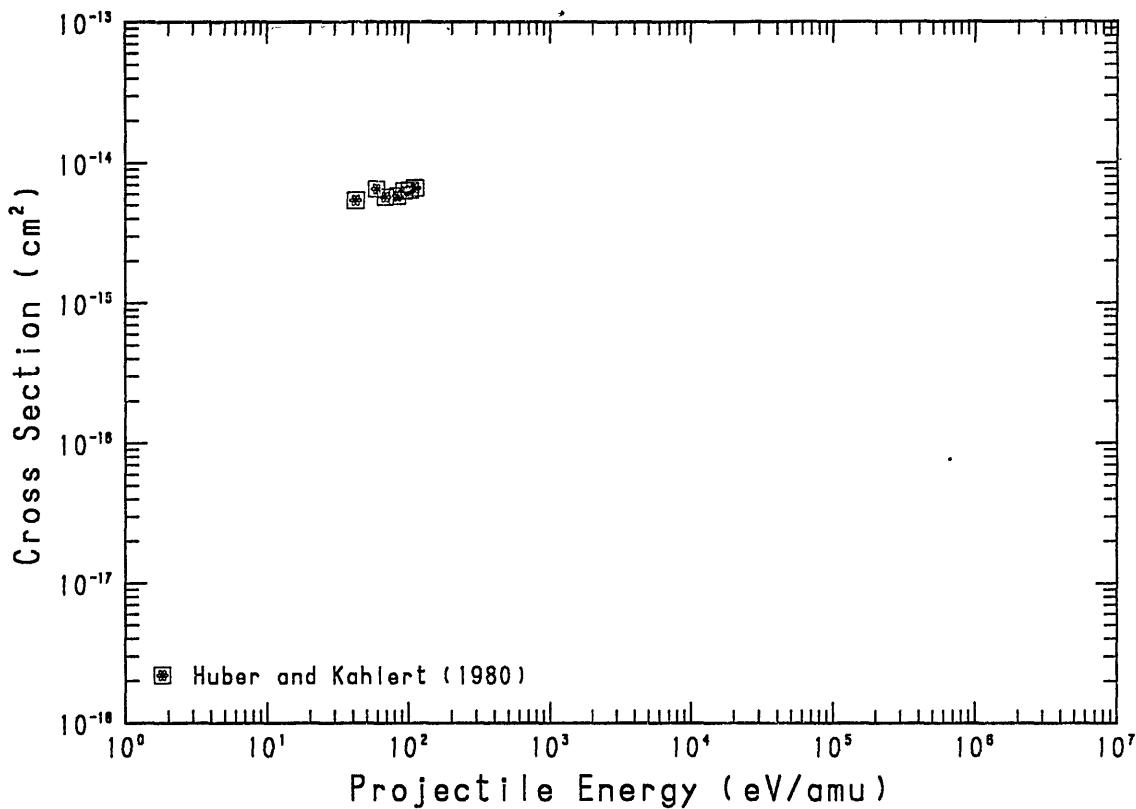


Fig.148 $\text{Kr}^{8+} + \text{H}_2 \rightarrow \text{Kr}^{7+}$

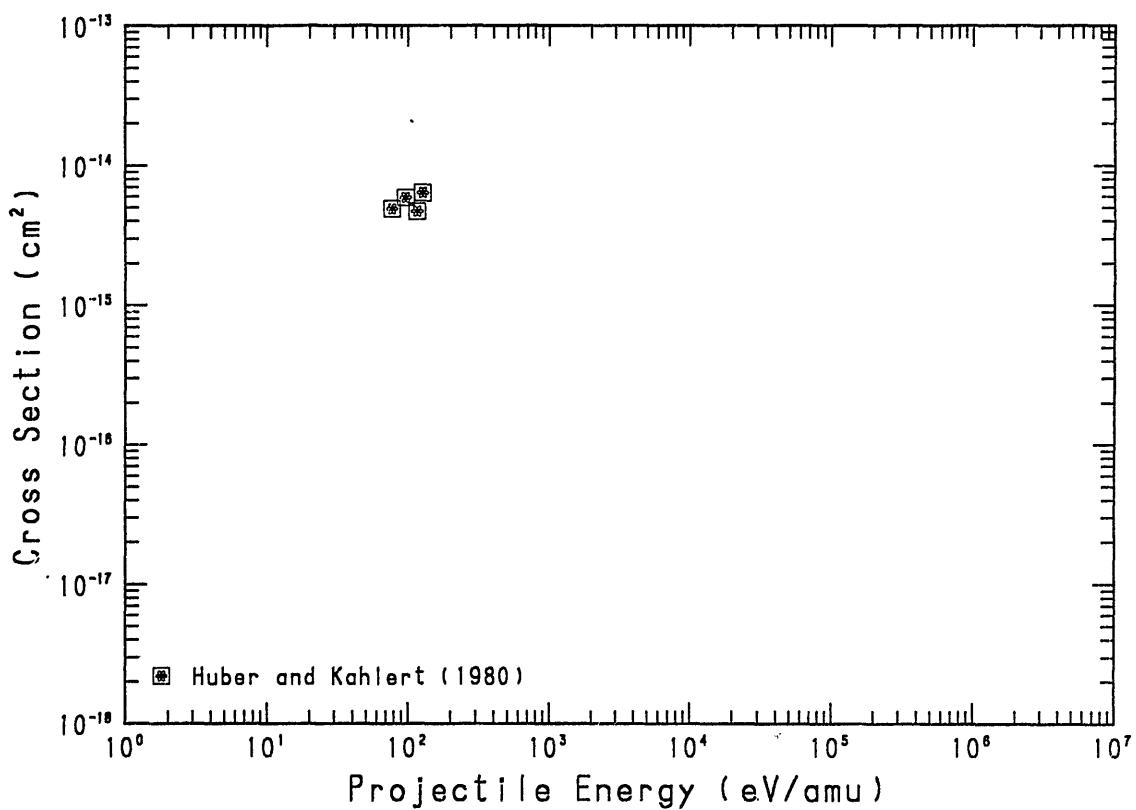


Fig. 149 $\text{Mo}^{4+} + \text{H}_2 \rightarrow \text{Mo}^{3+}$

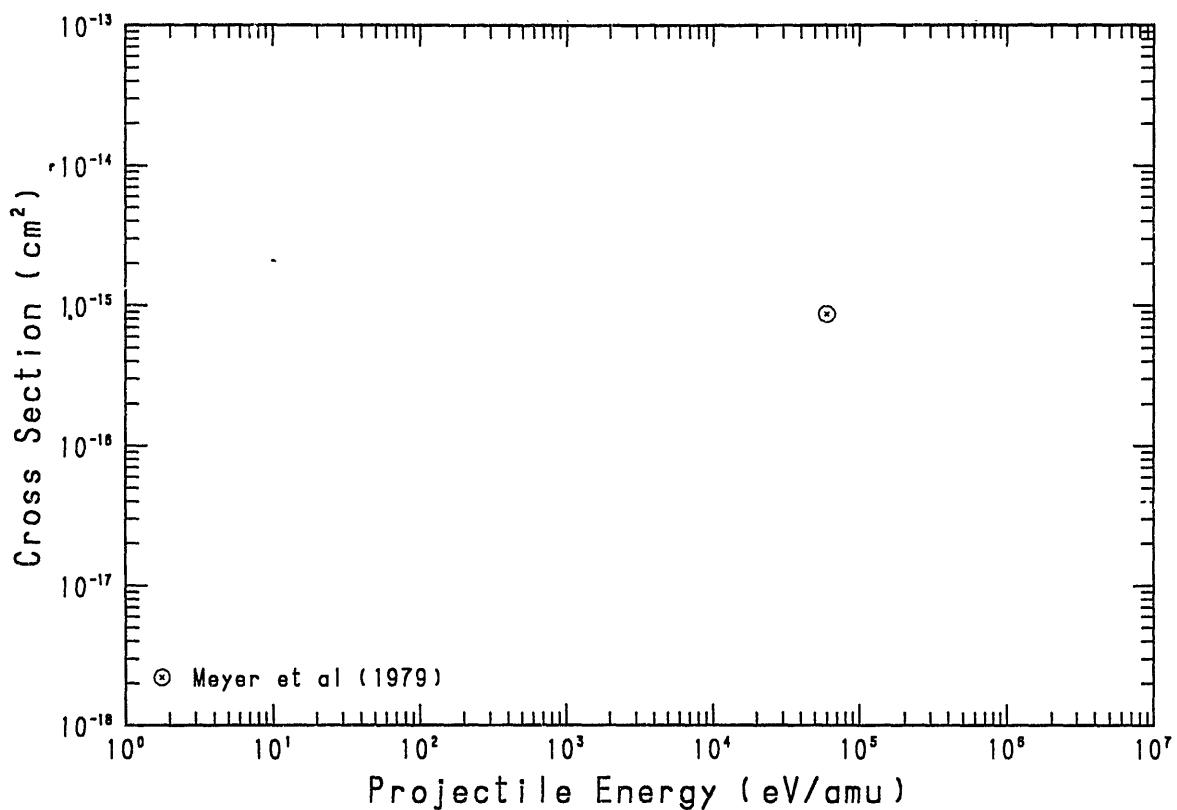


Fig. 150 $\text{Mo}^{5+} + \text{H}_2 \rightarrow \text{Mo}^{4+}$

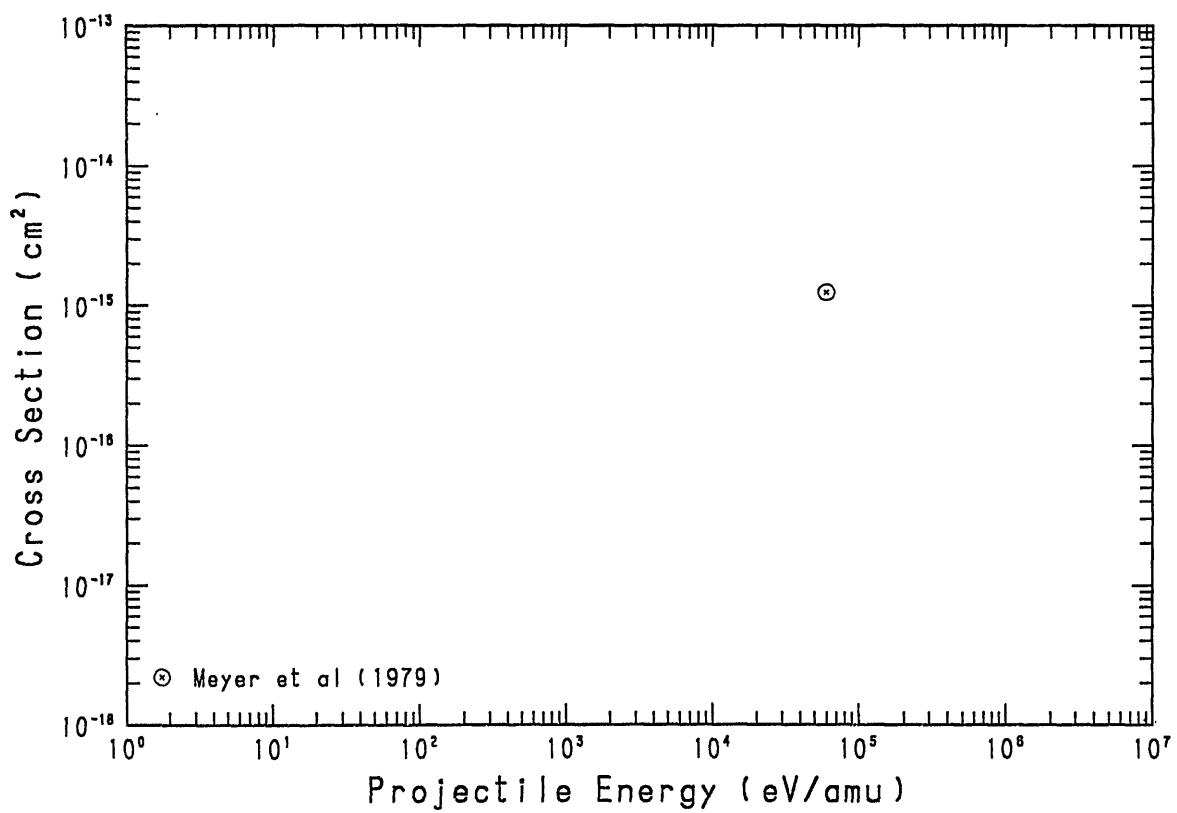


Fig.151 $\text{Mo}^{6+} + \text{H}_2 \rightarrow \text{Mo}^{5+}$

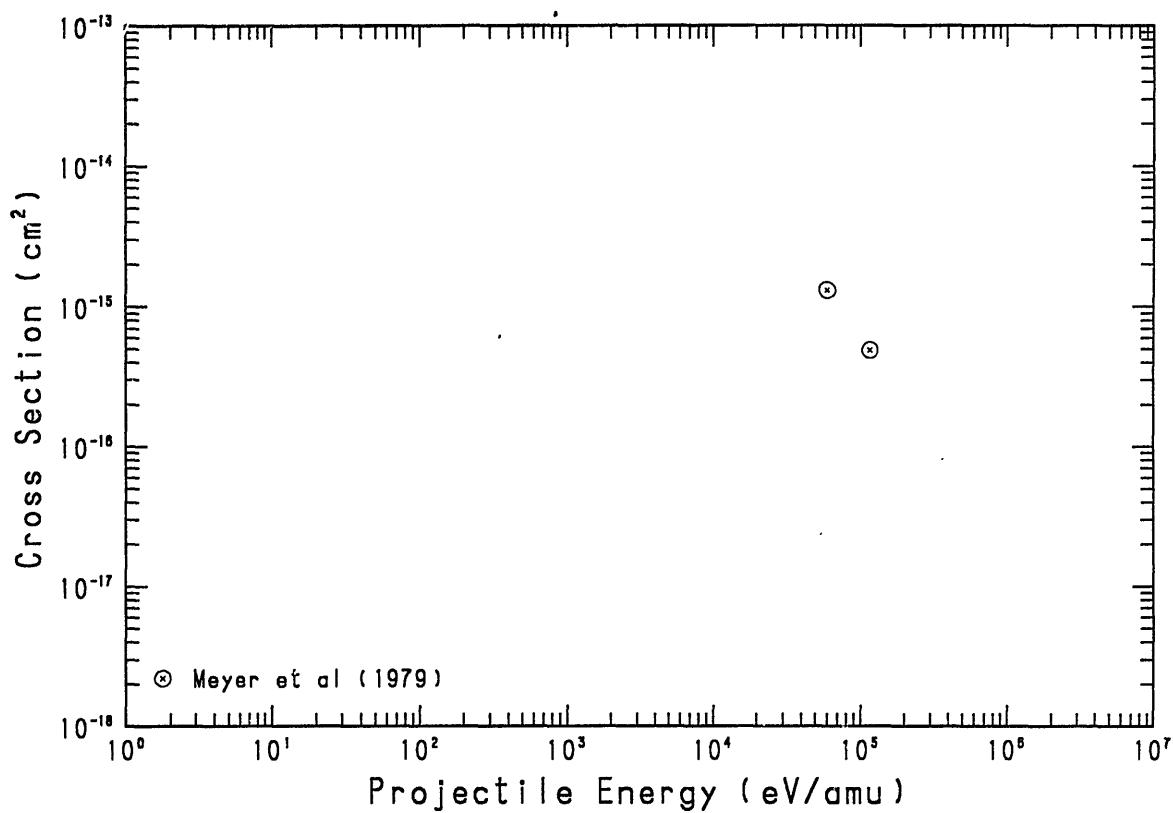


Fig.152 $\text{Mo}^{7+} + \text{H}_2 \rightarrow \text{Mo}^{6+}$

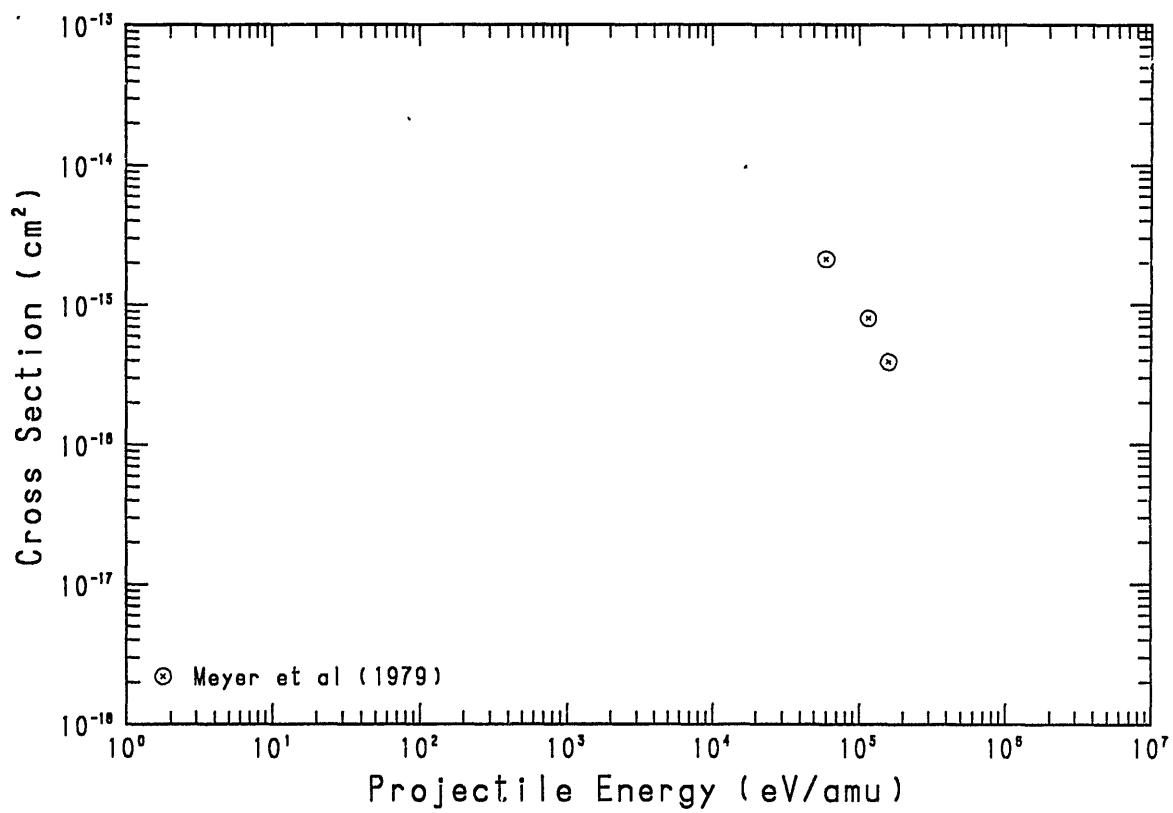


Fig. 153 $\text{Mo}^{8+} + \text{H}_2 \rightarrow \text{Mo}^{7+}$

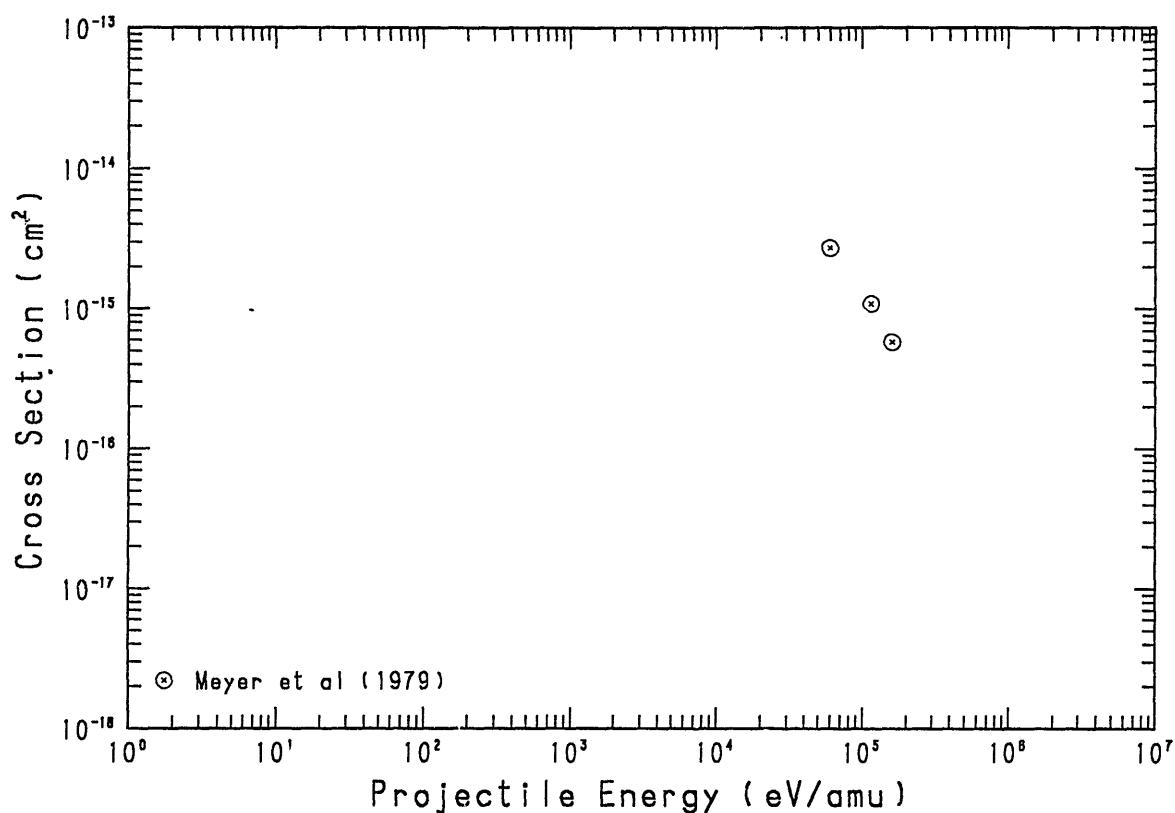


Fig. 154 $\text{Mo}^{8+} + \text{H}_2 \rightarrow \text{Mo}^{8+}$

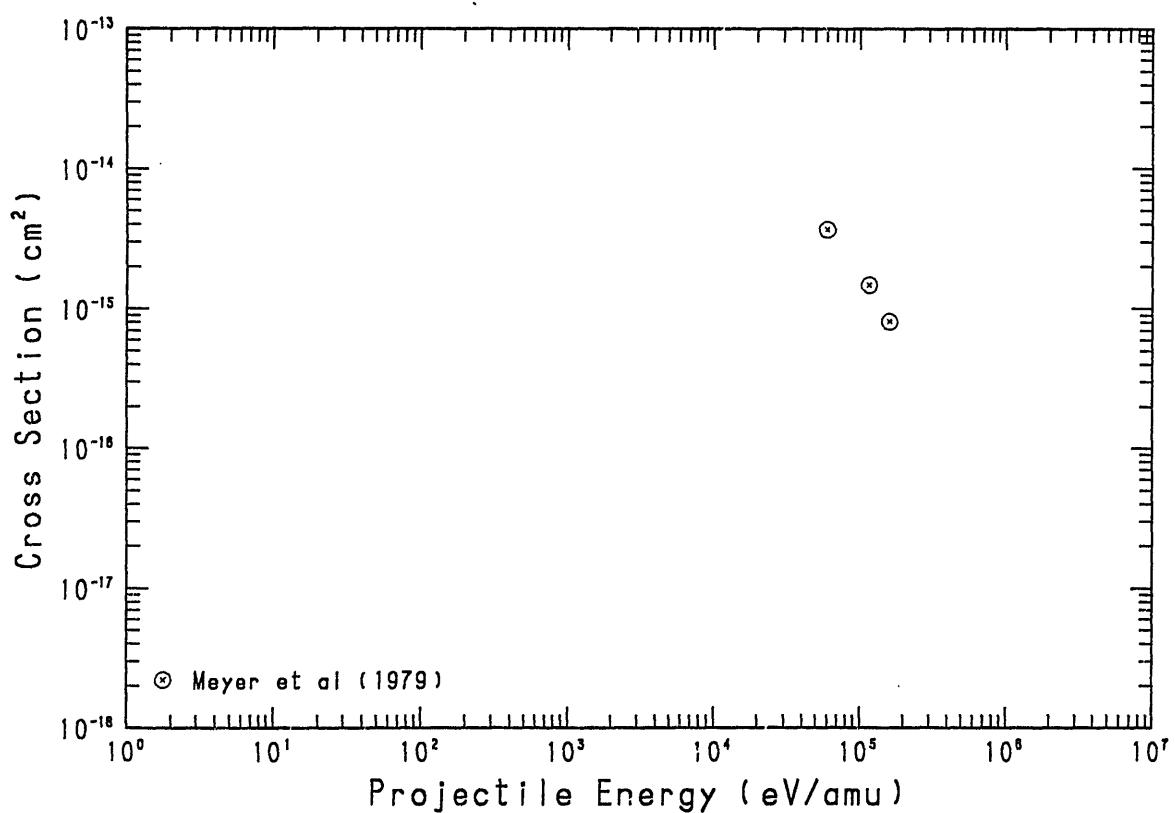


Fig.155 $\text{Mo}^{10+} + \text{H}_2 \rightarrow \text{Mo}^{9+}$

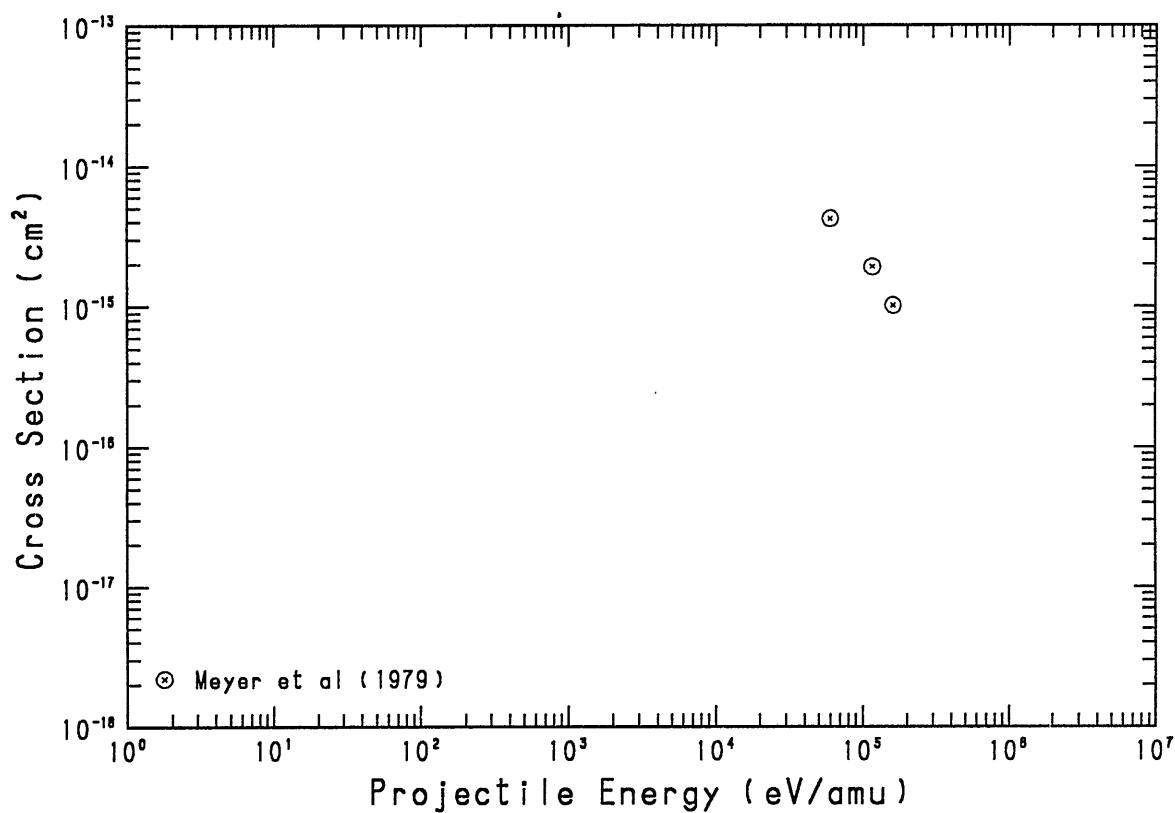


Fig.156 $\text{Mo}^{11+} + \text{H}_2 \rightarrow \text{Mo}^{10+}$

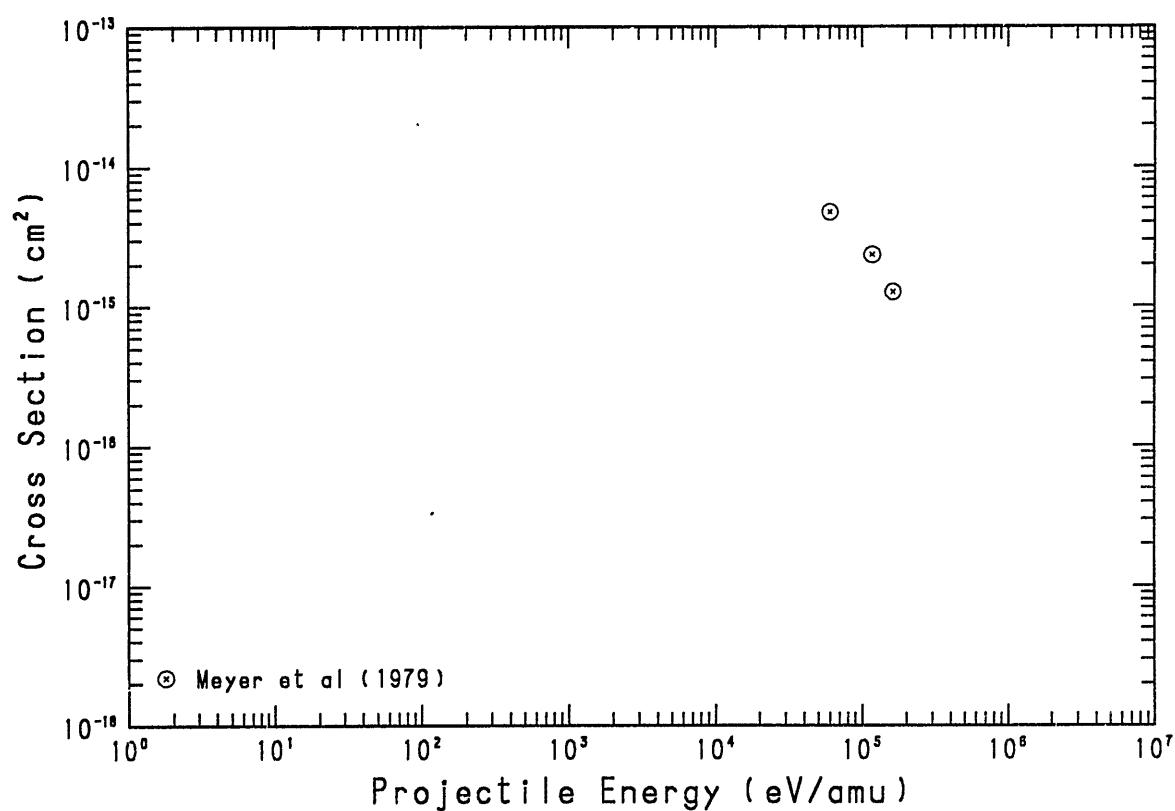


Fig. 157 $\text{Mo}^{12+} + \text{H}_2 \rightarrow \text{Mo}^{11+}$

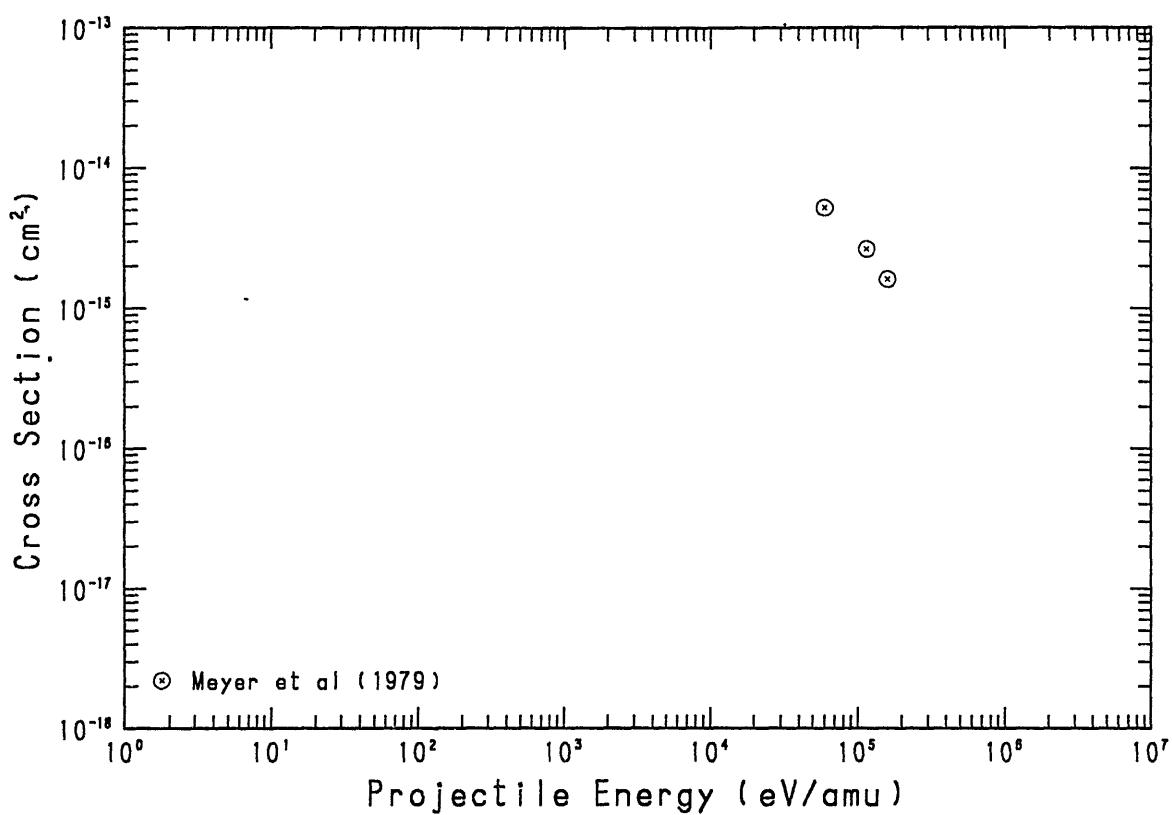


Fig. 158 $\text{Mo}^{13+} + \text{H}_2 \rightarrow \text{Mo}^{12+}$

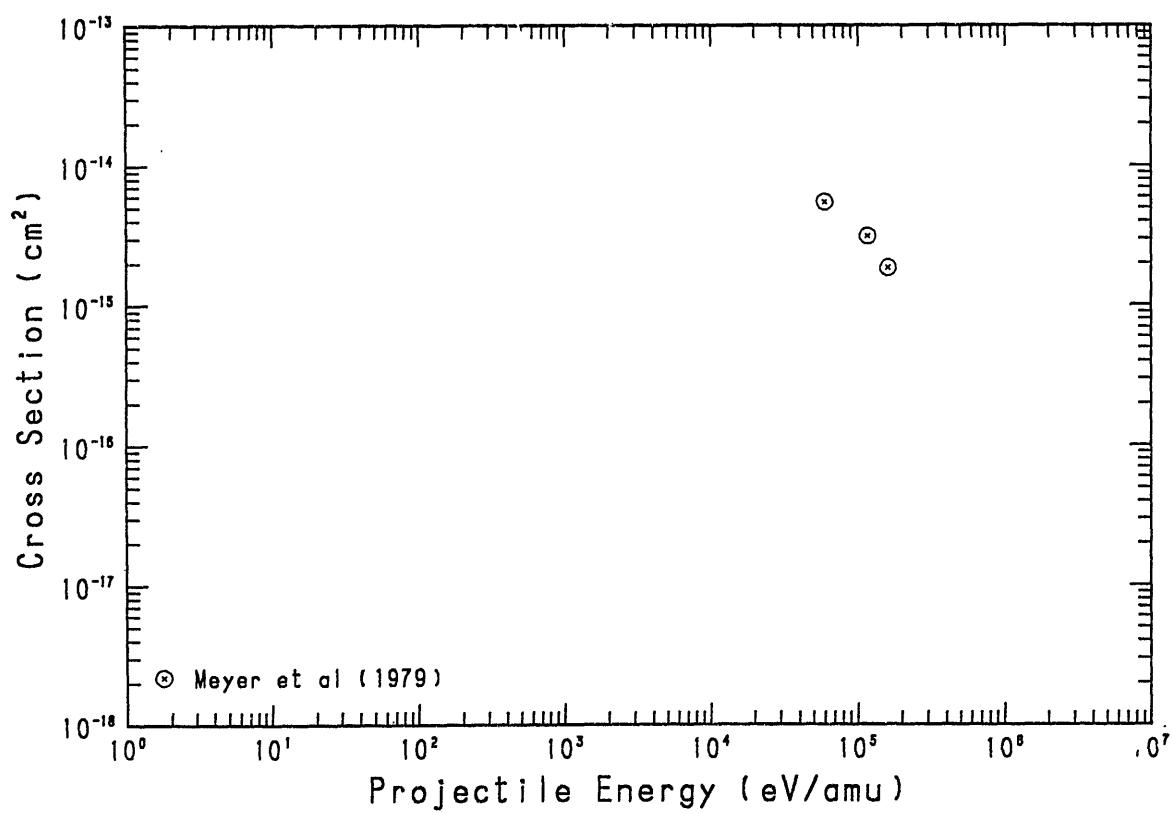


Fig.159 $\text{Mo}^{14+} + \text{H}_2 \rightarrow \text{Mo}^{13+}$

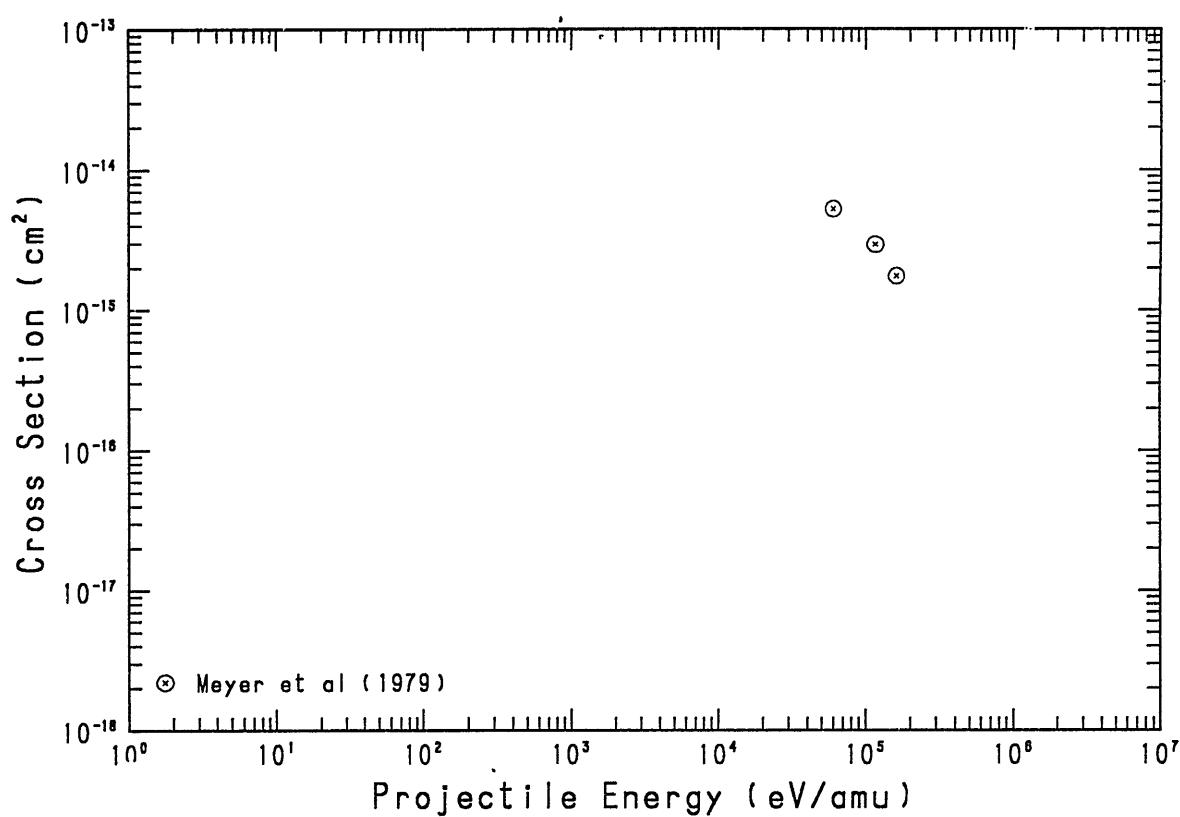


Fig.160 $\text{Mo}^{15+} + \text{H}_2 \rightarrow \text{Mo}^{14+}$

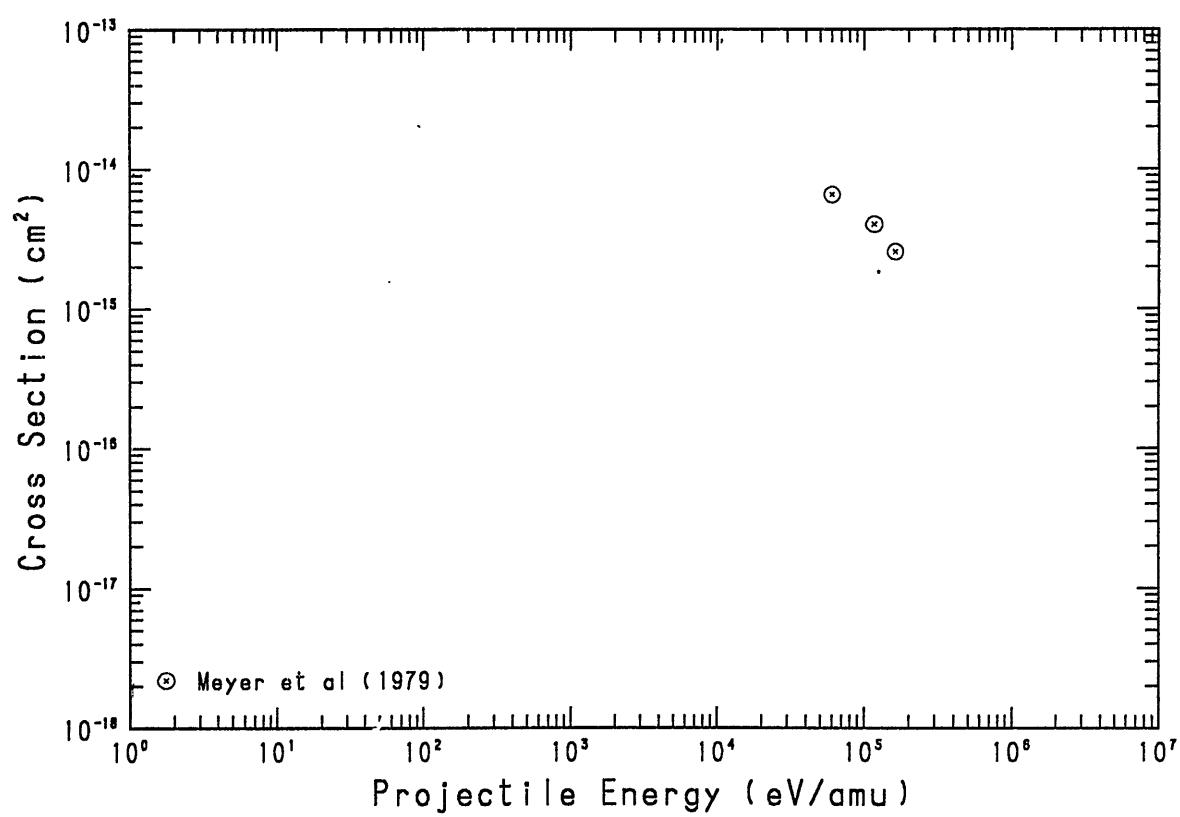


Fig.161 $\text{Mo}^{16+} + \text{H}_2 \rightarrow \text{Mo}^{15+}$

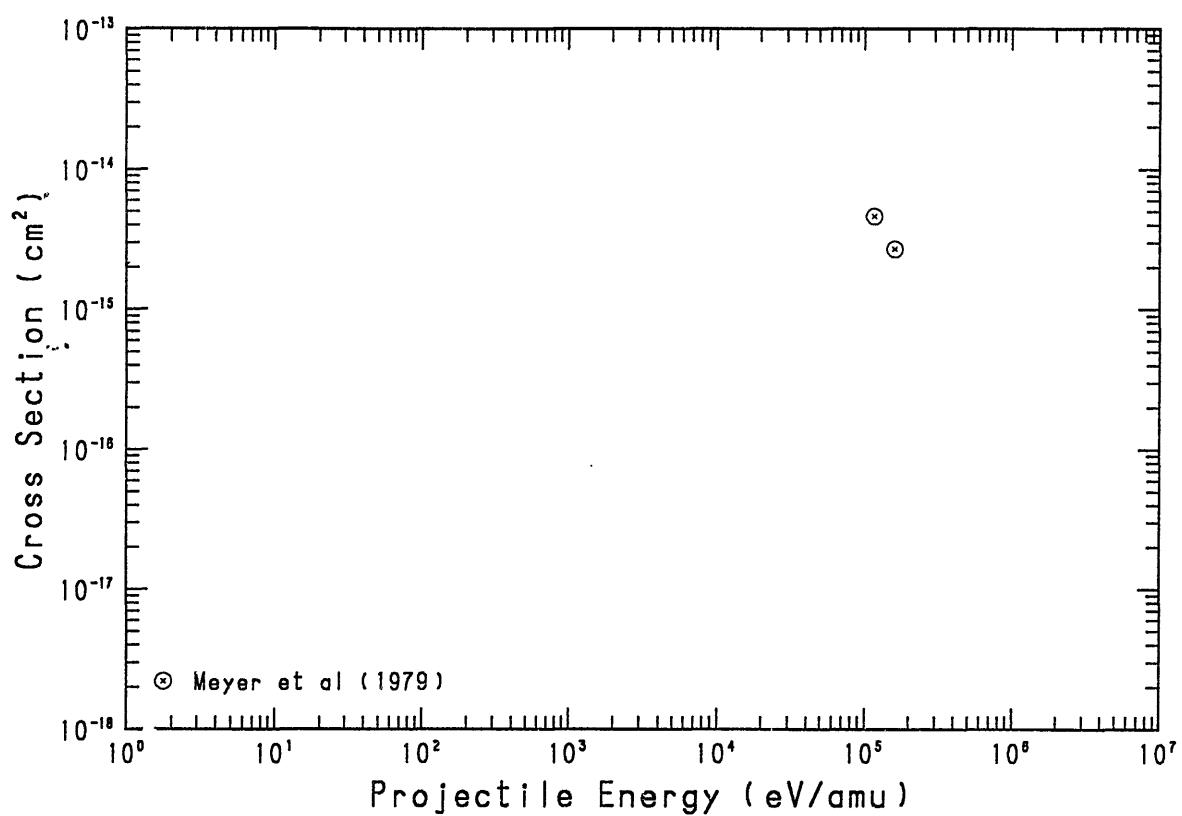


Fig.162 $\text{Mo}^{17+} + \text{H}_2 \rightarrow \text{Mo}^{16+}$

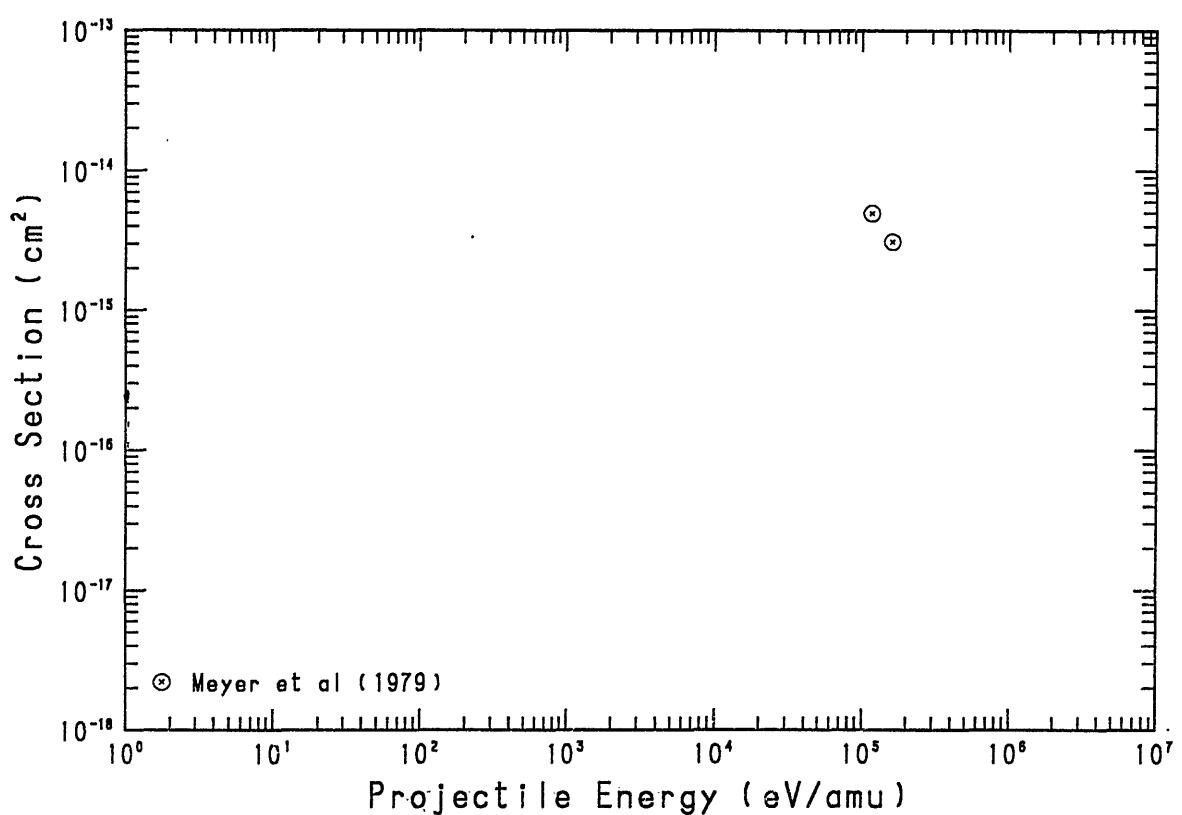


Fig. 163 $\text{Mo}^{18+} + \text{H}_2 \rightarrow \text{Mo}^{17+}$

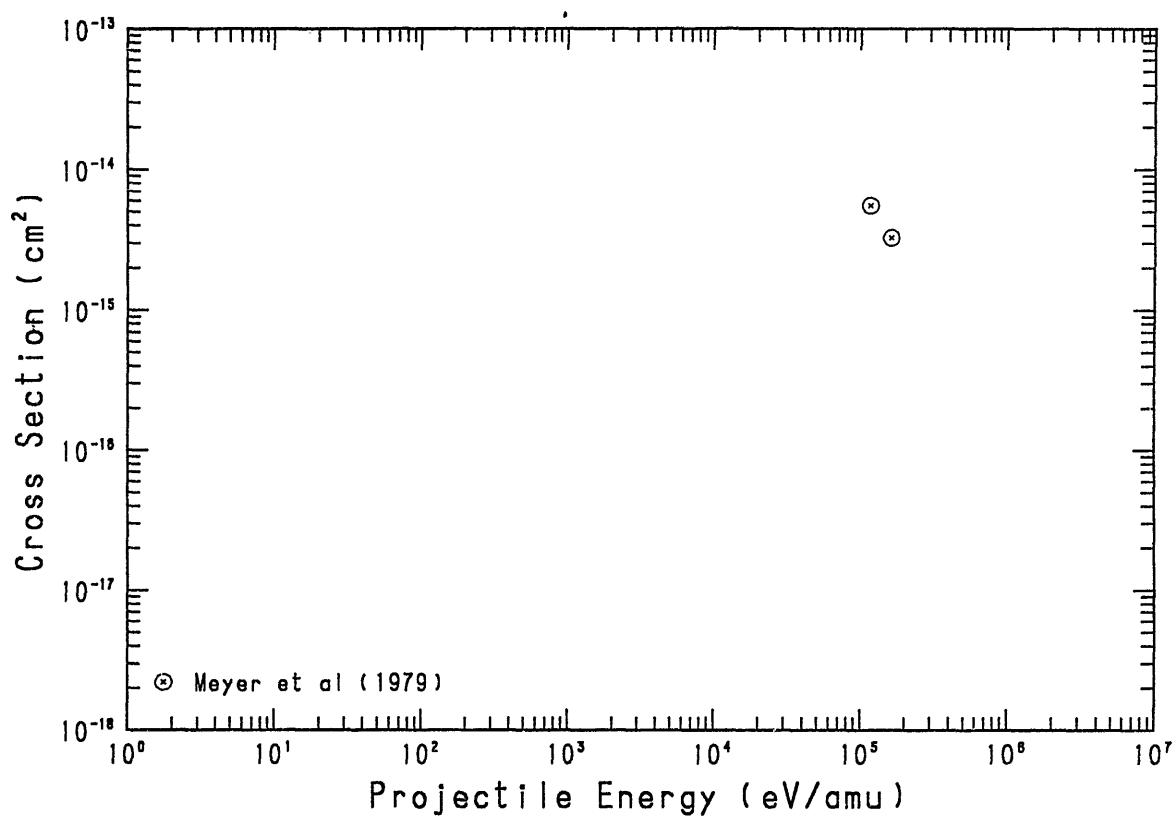


Fig. 164 $\text{Cd}^{2+} + \text{H}_2 \rightarrow \text{Cd}^+$

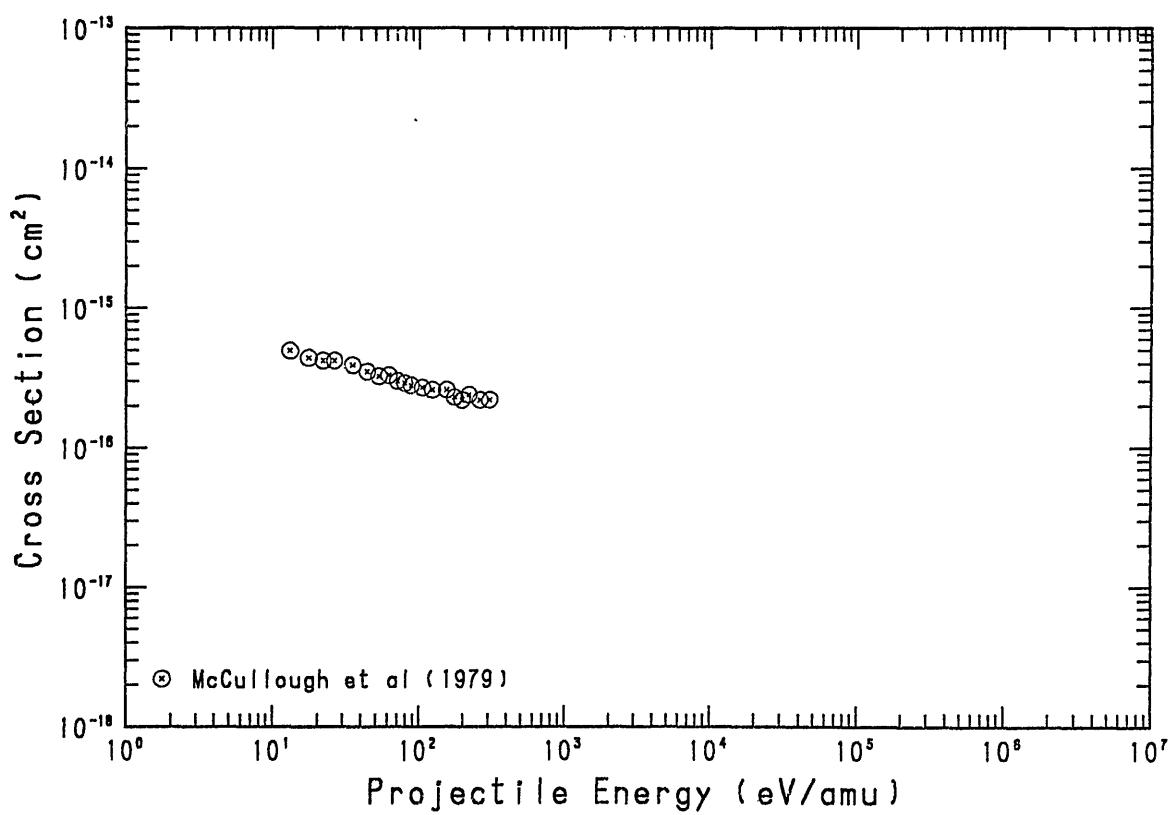


Fig. 165 $I^{2+} + H_2 \rightarrow I$

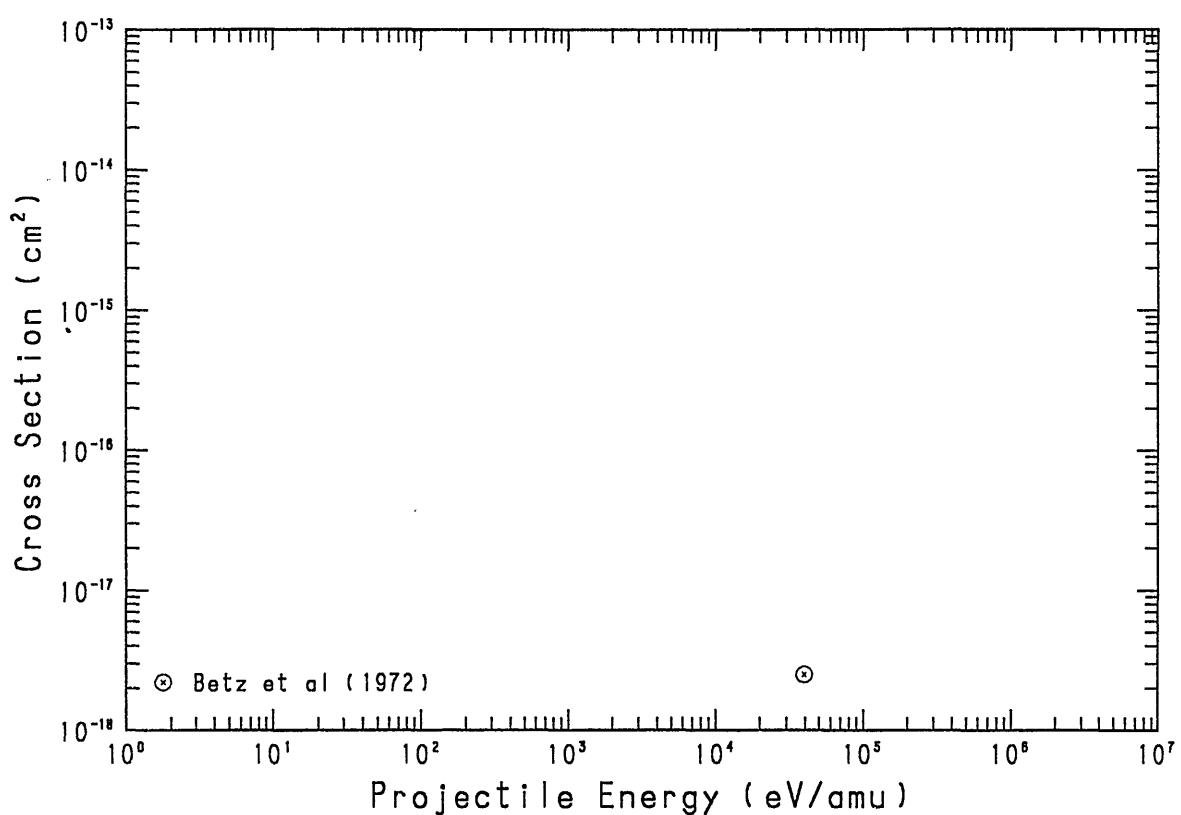


Fig. 166 $I^{2+} + H_2 \rightarrow I^+$

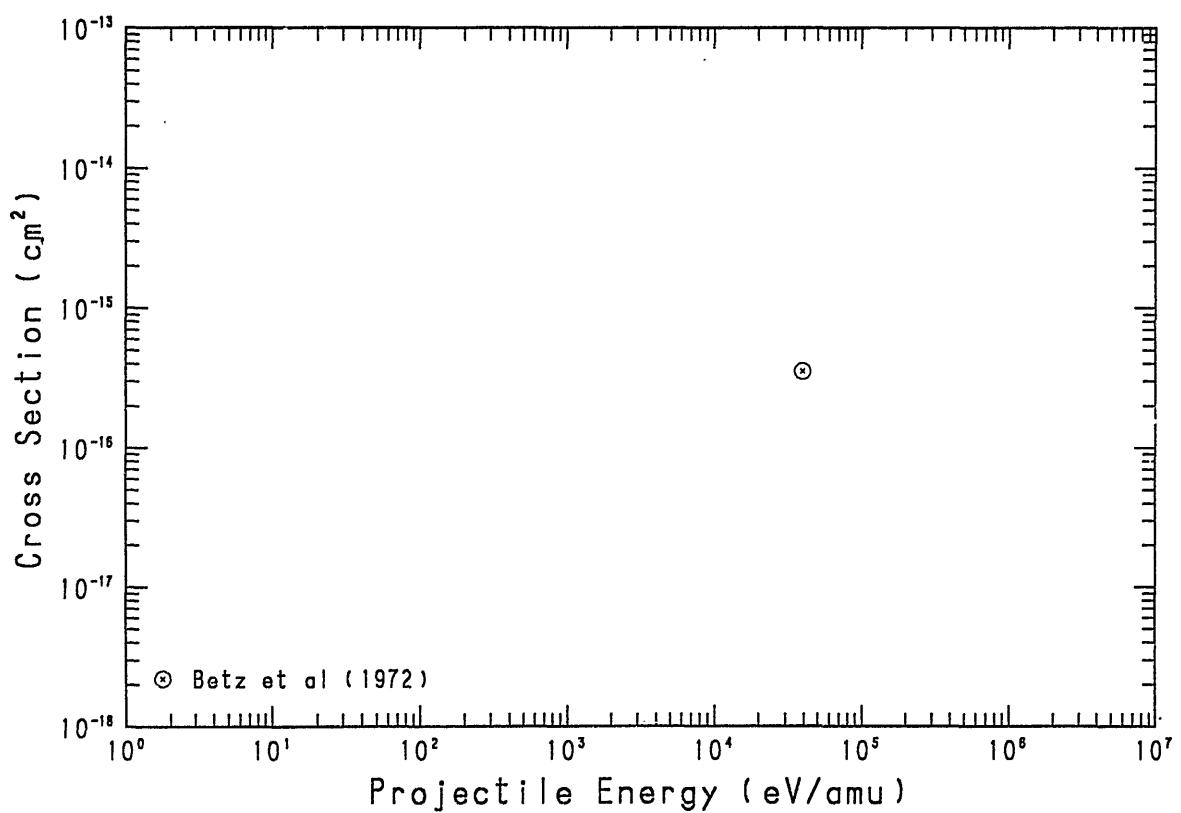


Fig. 167 $\text{I}^{3+} + \text{H}_2 \rightarrow \text{I}^+$

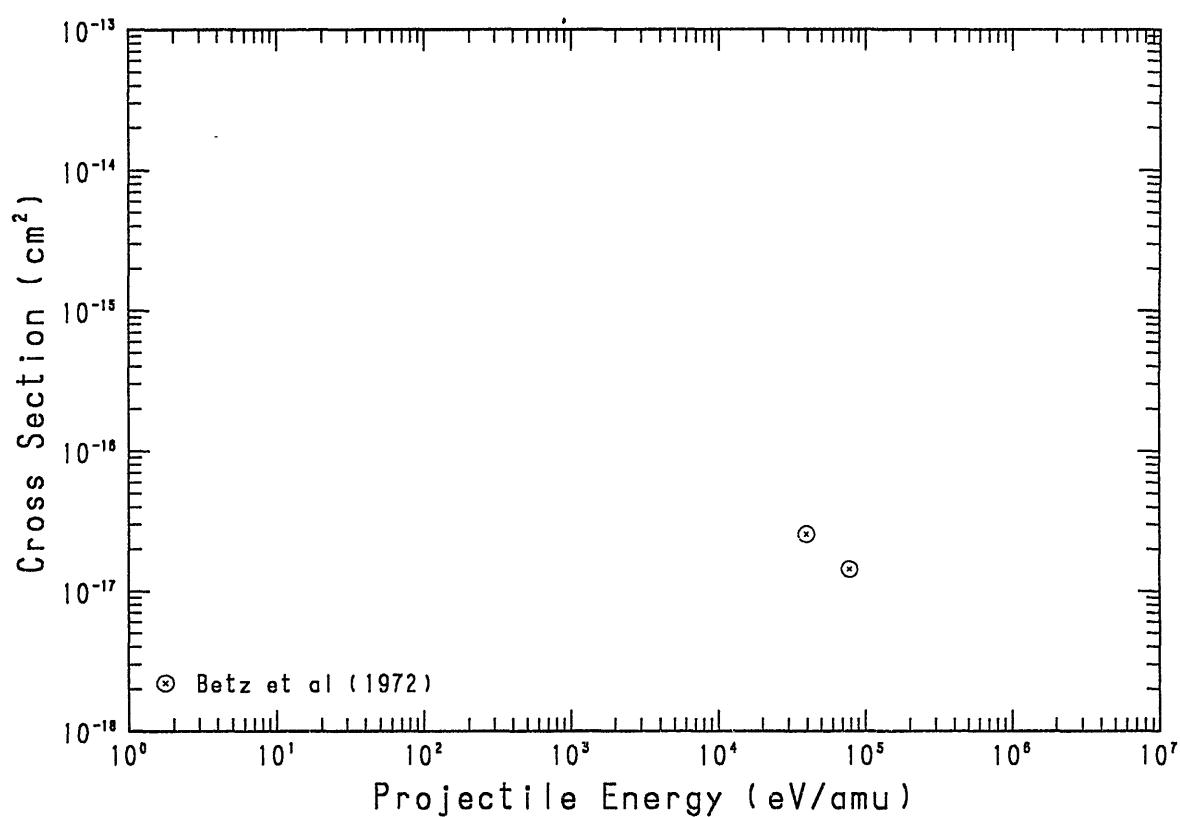


Fig. 168 $\text{I}^{3+} + \text{H}_2 \rightarrow \text{I}^{2+}$

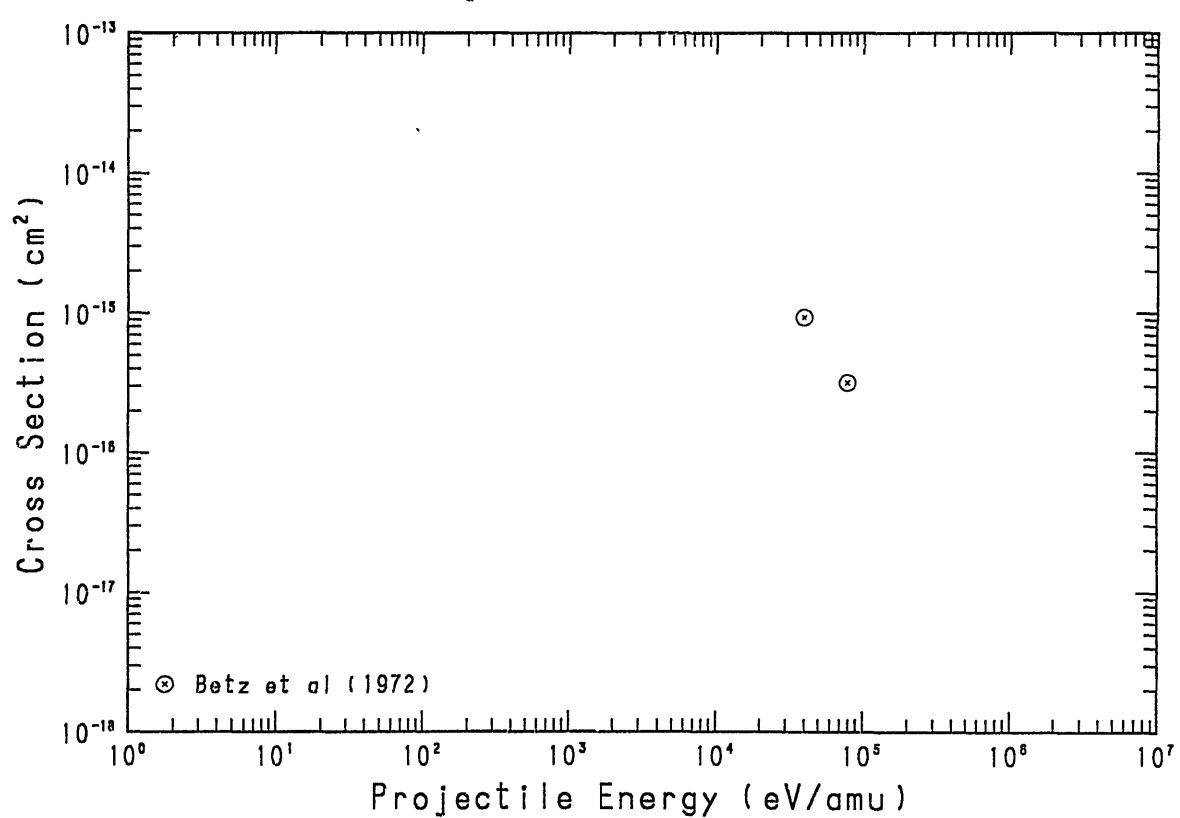


Fig. 169 $I^{4+} + H_2 \rightarrow I^{2+}$

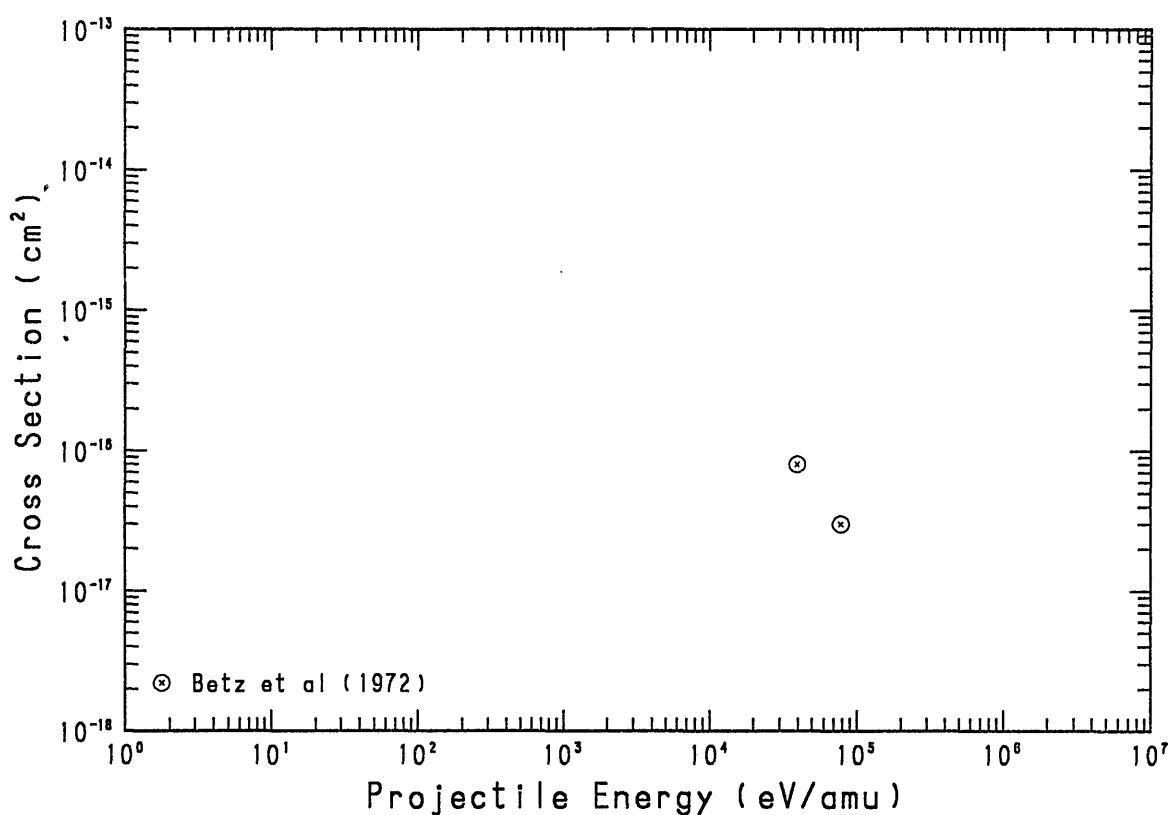


Fig. 170 $I^{4+} + H_2 \rightarrow I^{3+}$

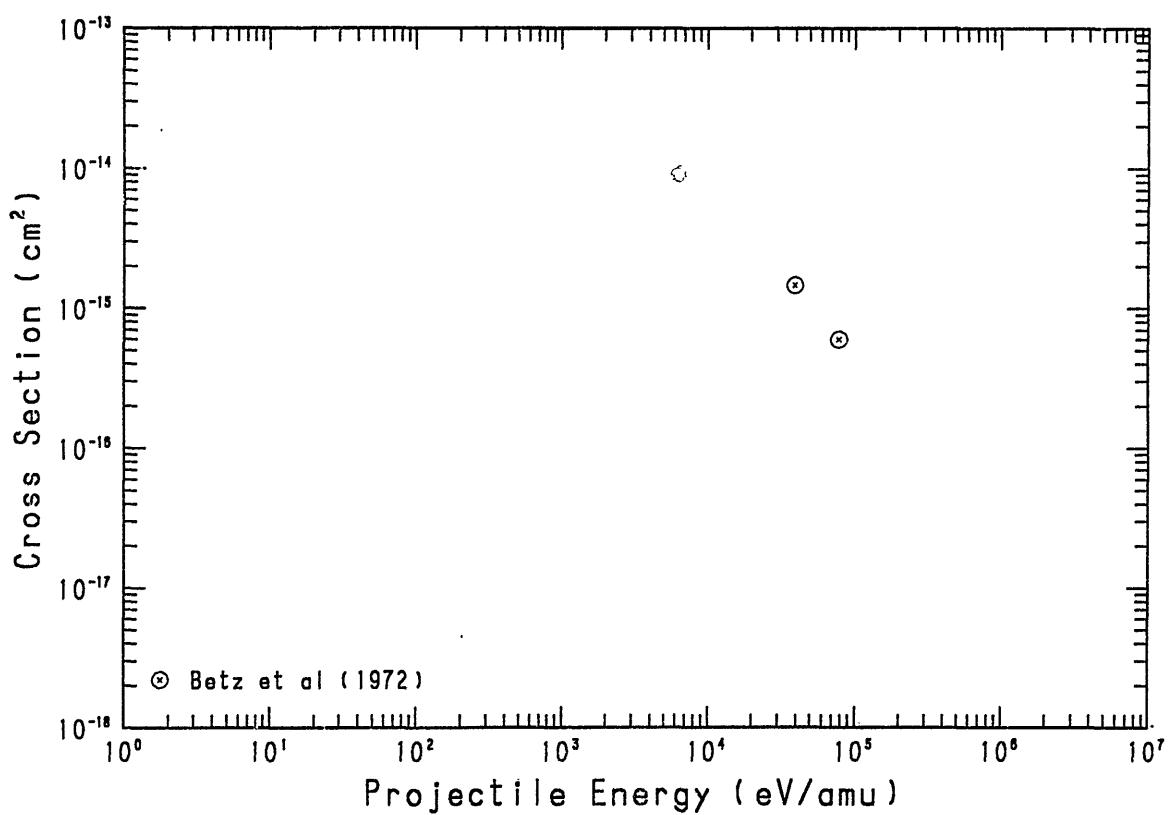


Fig. 171 $\text{I}^{5+} + \text{H}_2 \rightarrow \text{I}^{3+}$

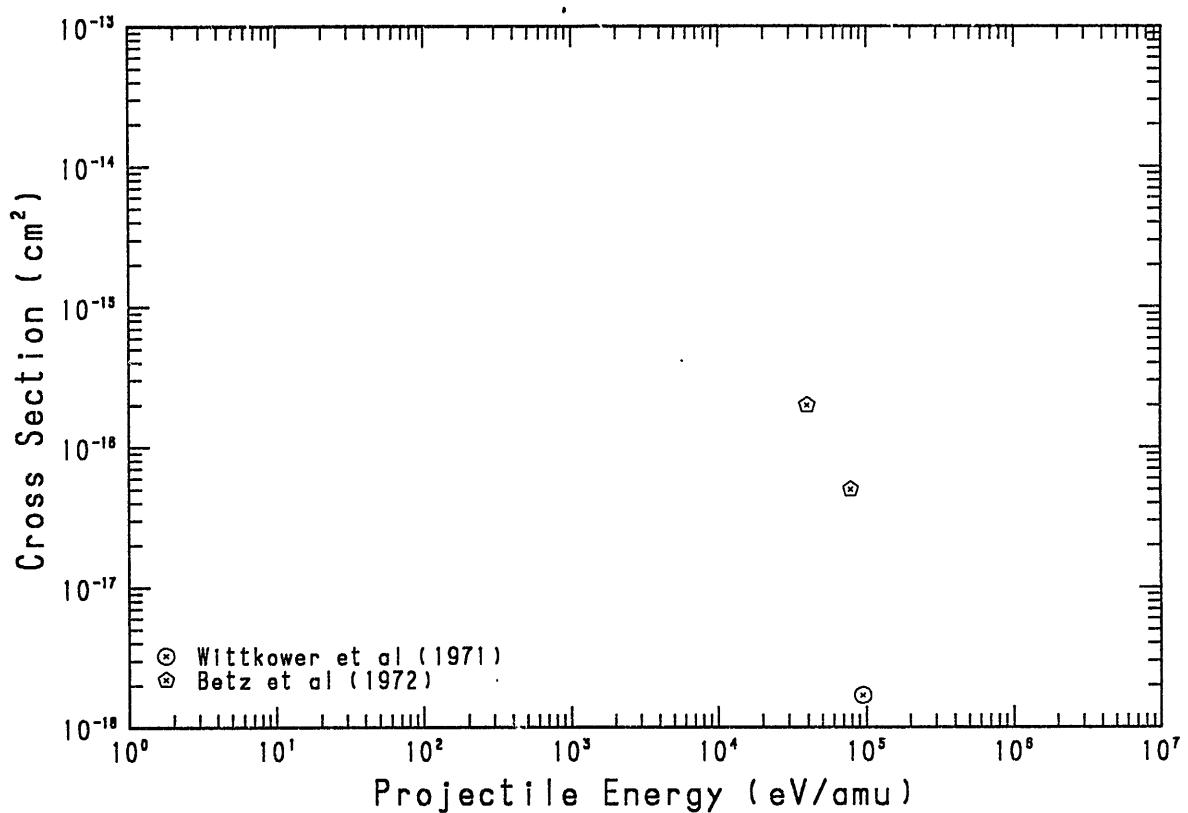


Fig. 172 $\text{I}^{5+} + \text{H}_2 \rightarrow \text{I}^{4+}$

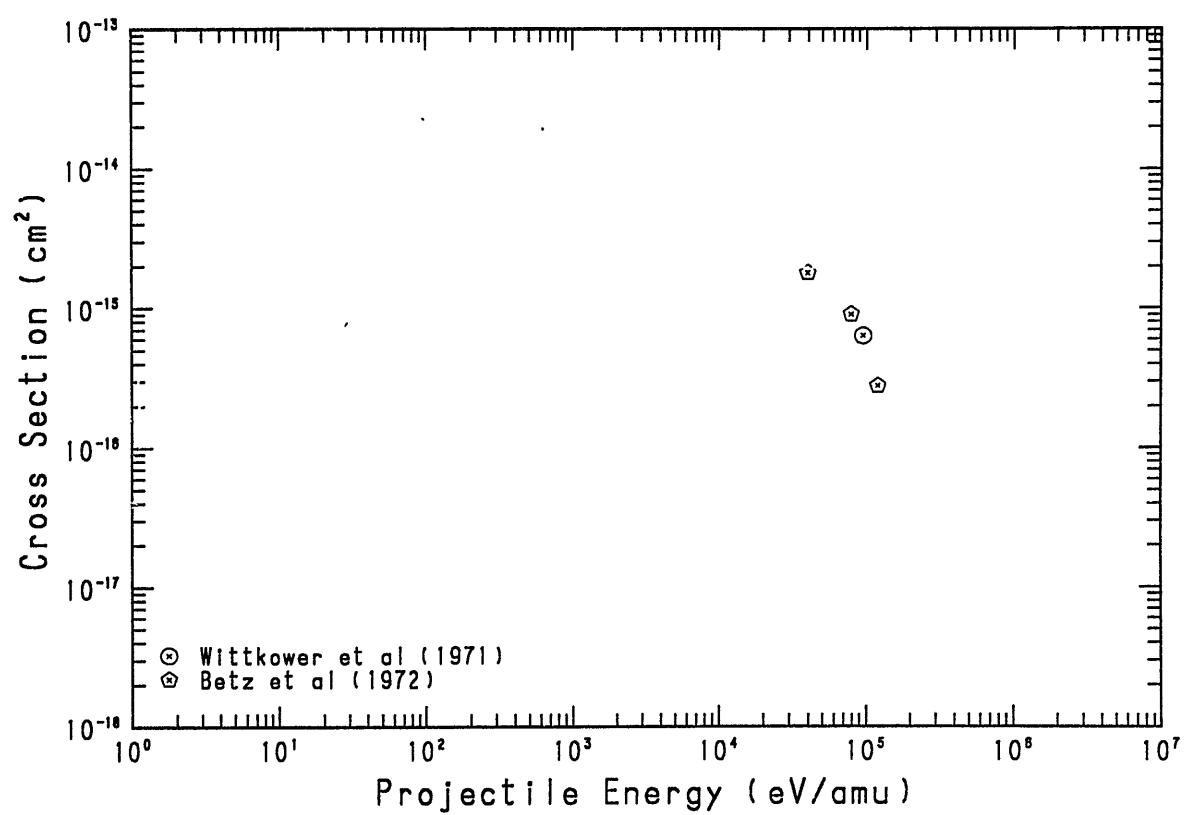


Fig. 173 $I^{6+} + H_2 \rightarrow I^{4+}$

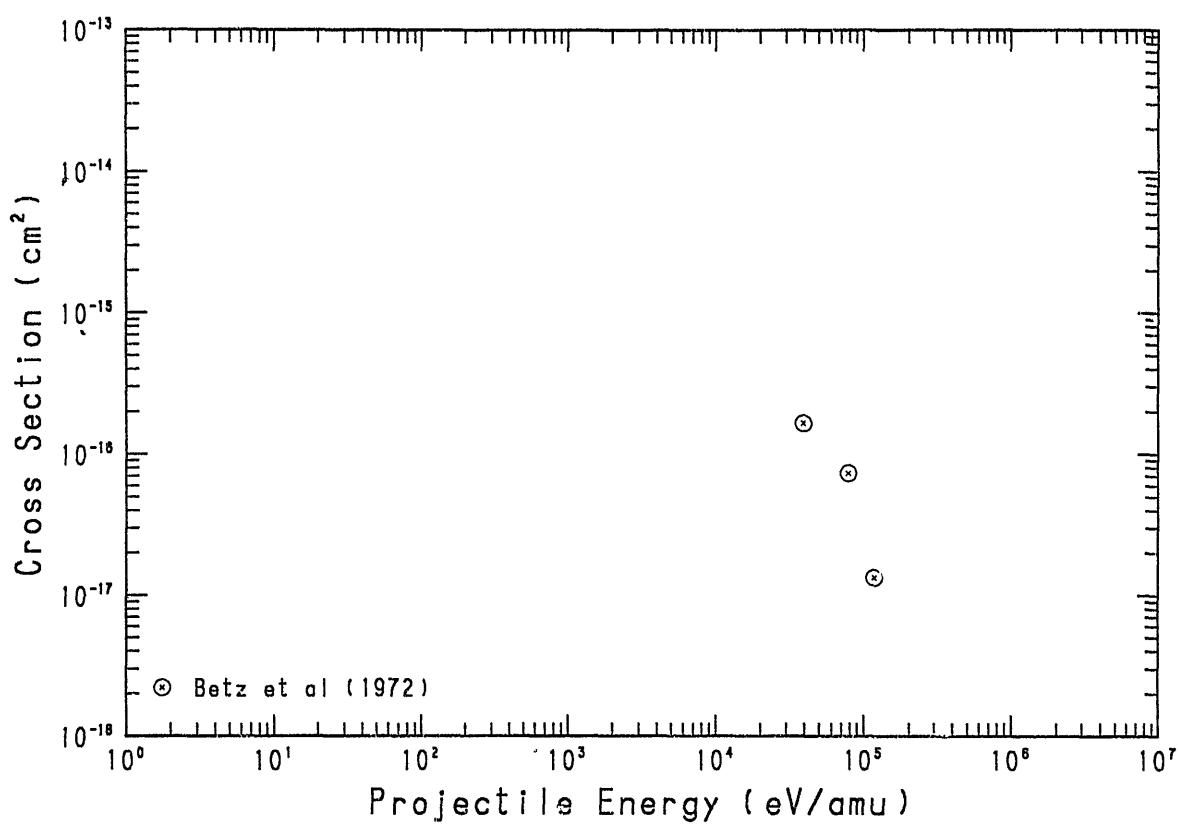


Fig. 174 $I^{6+} + H_2 \rightarrow I^{5+}$

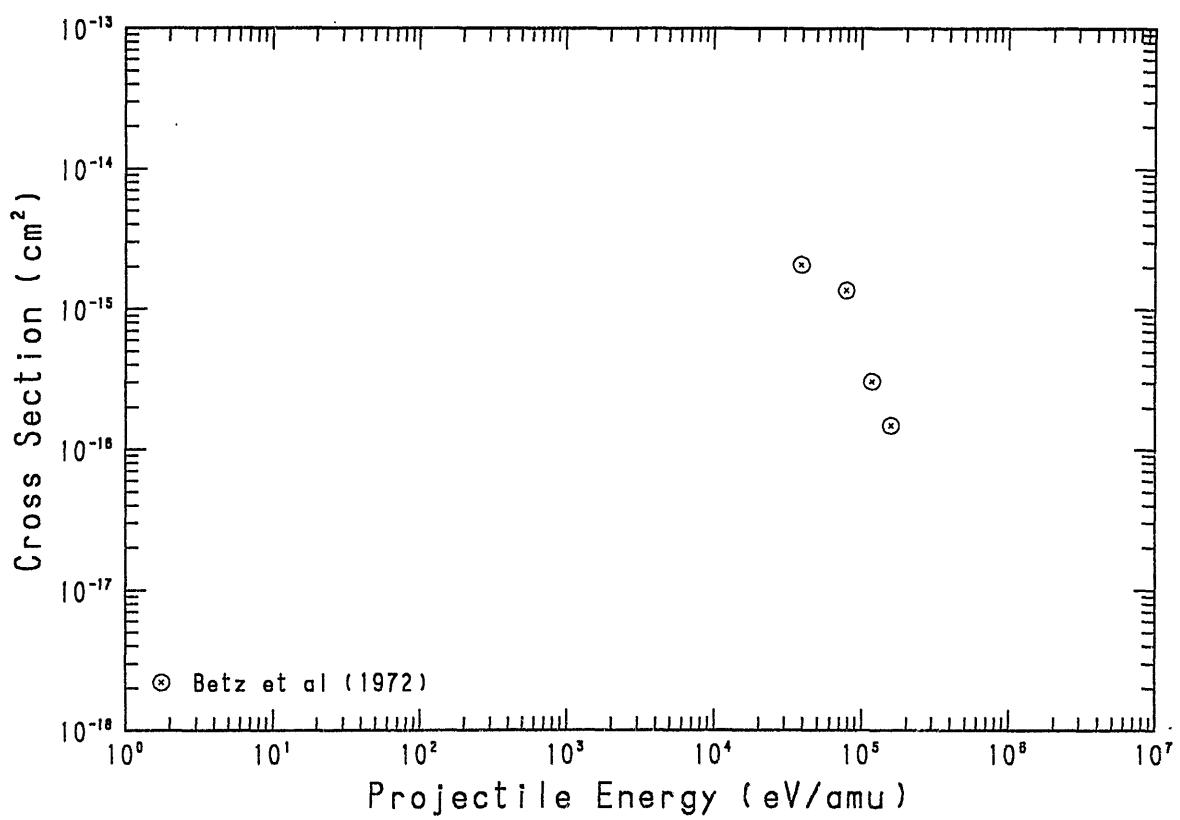


Fig. 175 $I^{7+} + H_2 \rightarrow I^{5+}$

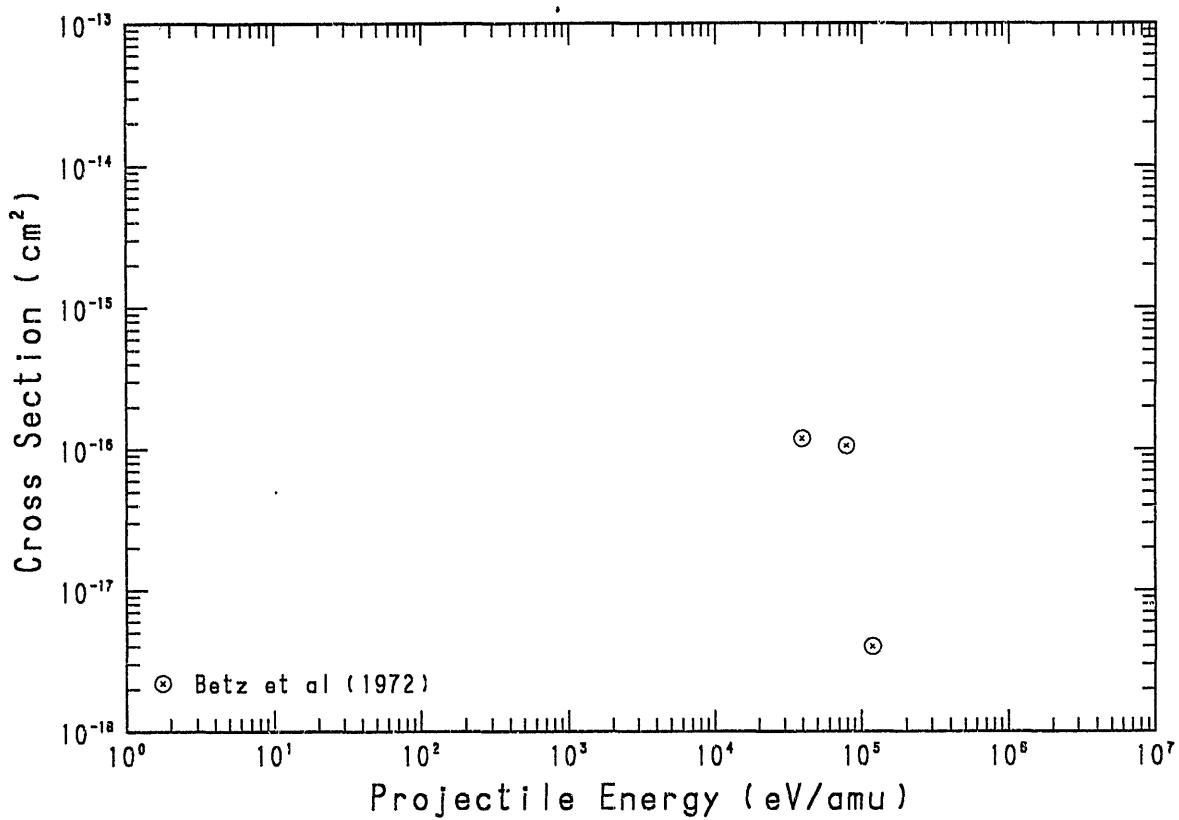


Fig. 176 $I^{7+} + H_2 \rightarrow I^{6+}$

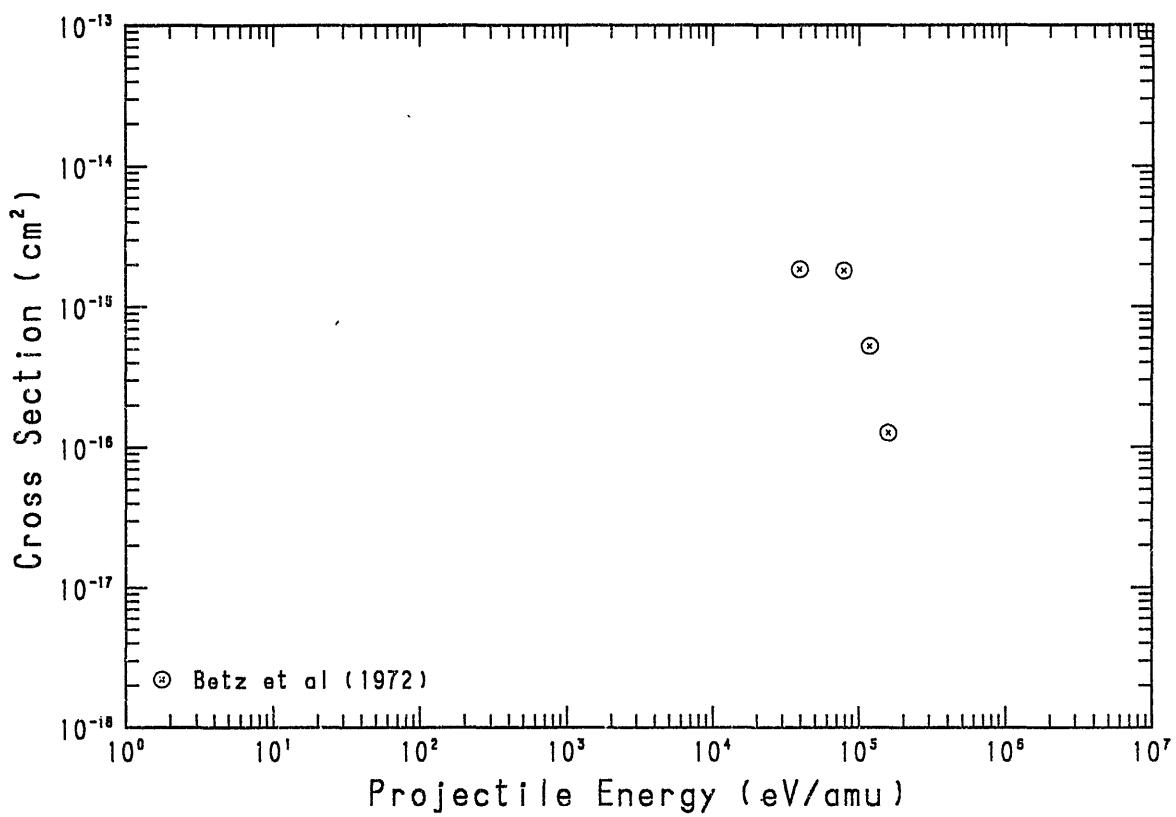


Fig.177 $I^{8+} + H_2 \rightarrow I^{6+}$

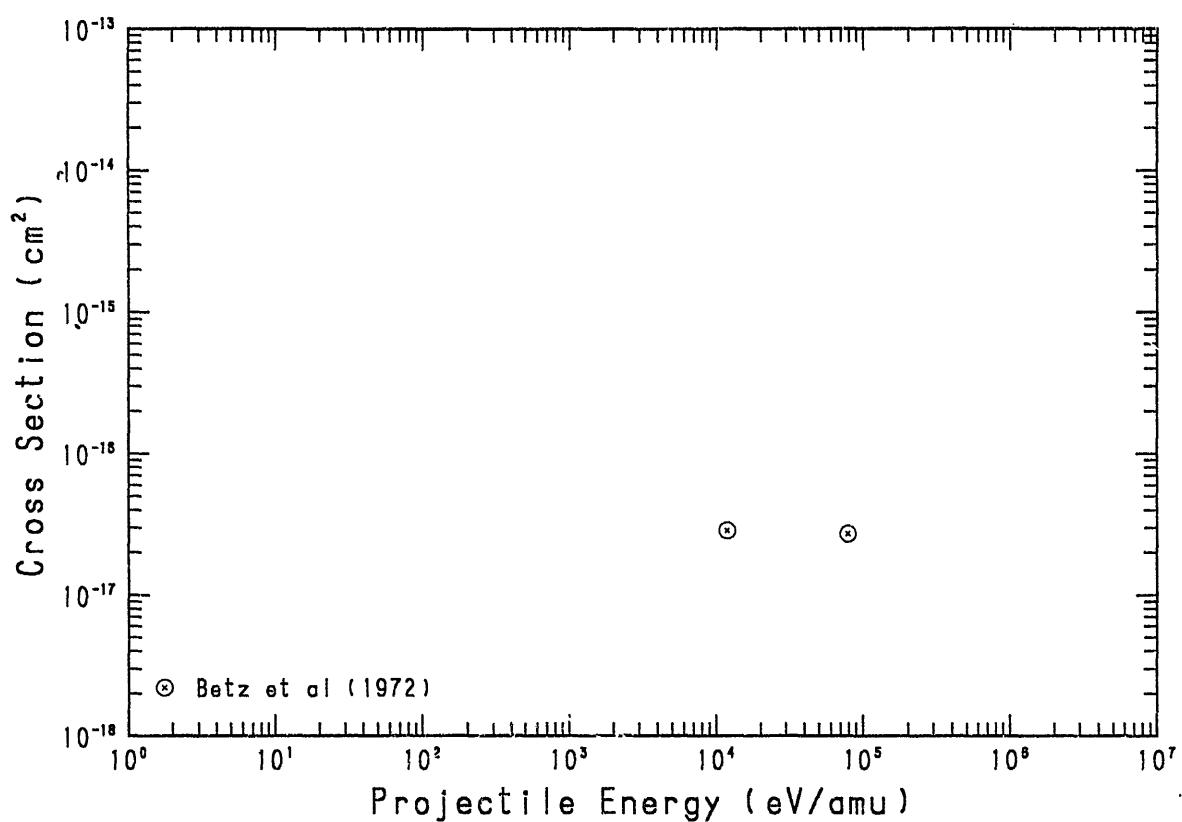


Fig.178 $I^{8+} + H_2 \rightarrow I^{7+}$

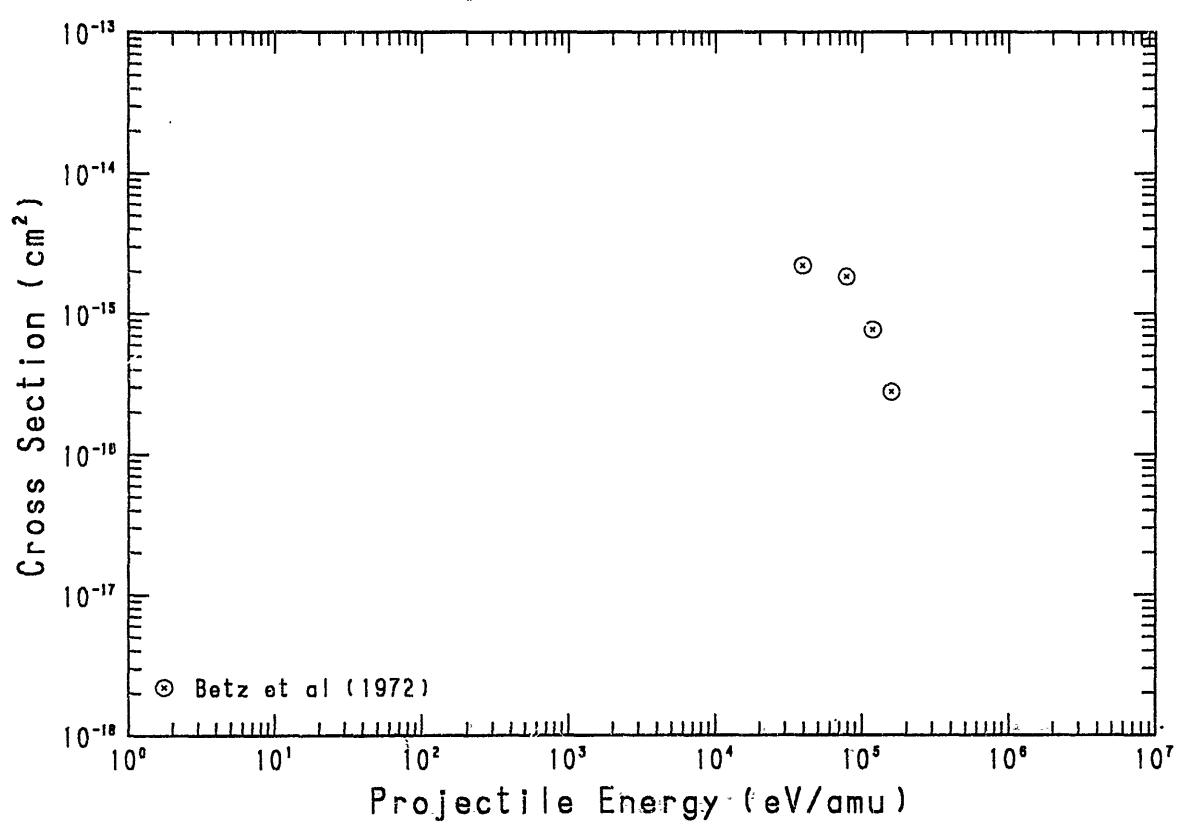


Fig. 179 $I^{9+} + H_2 \rightarrow I^{7+}$

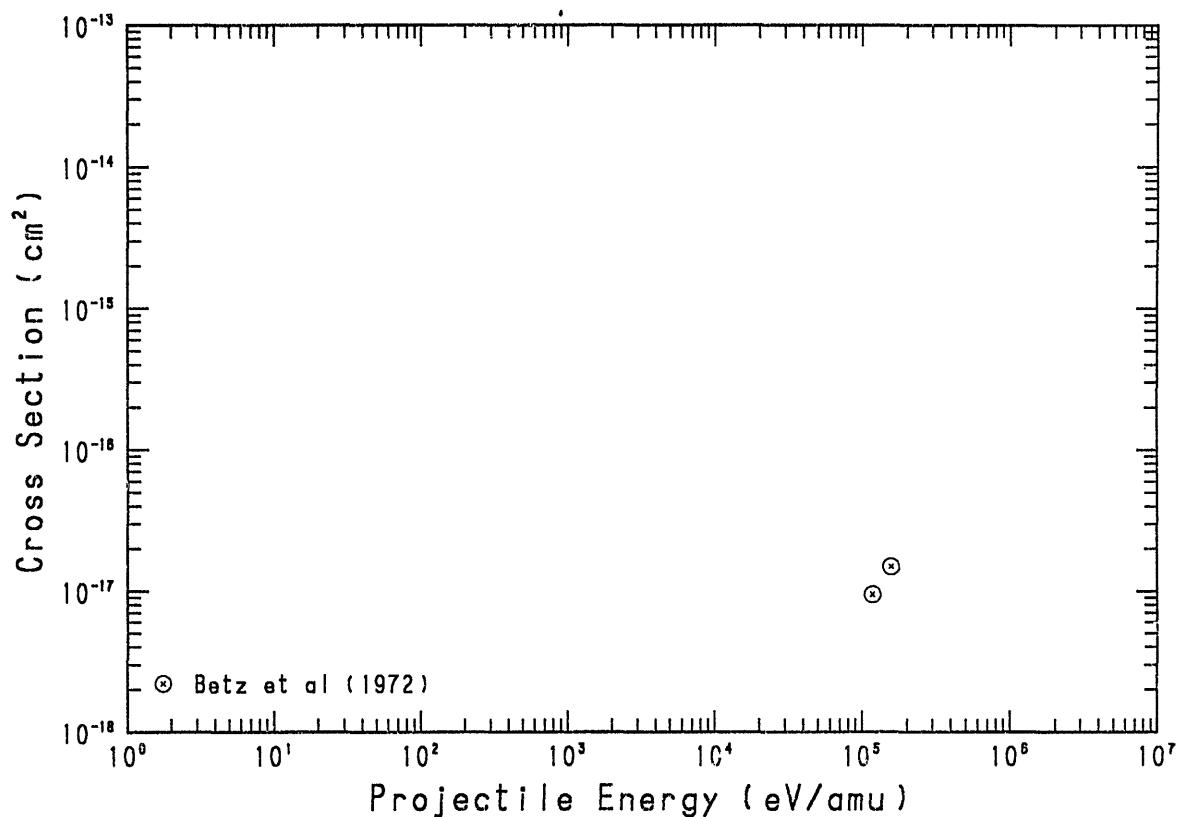


Fig. 180 $I^{9+} + H_2 \rightarrow I^{9+}$

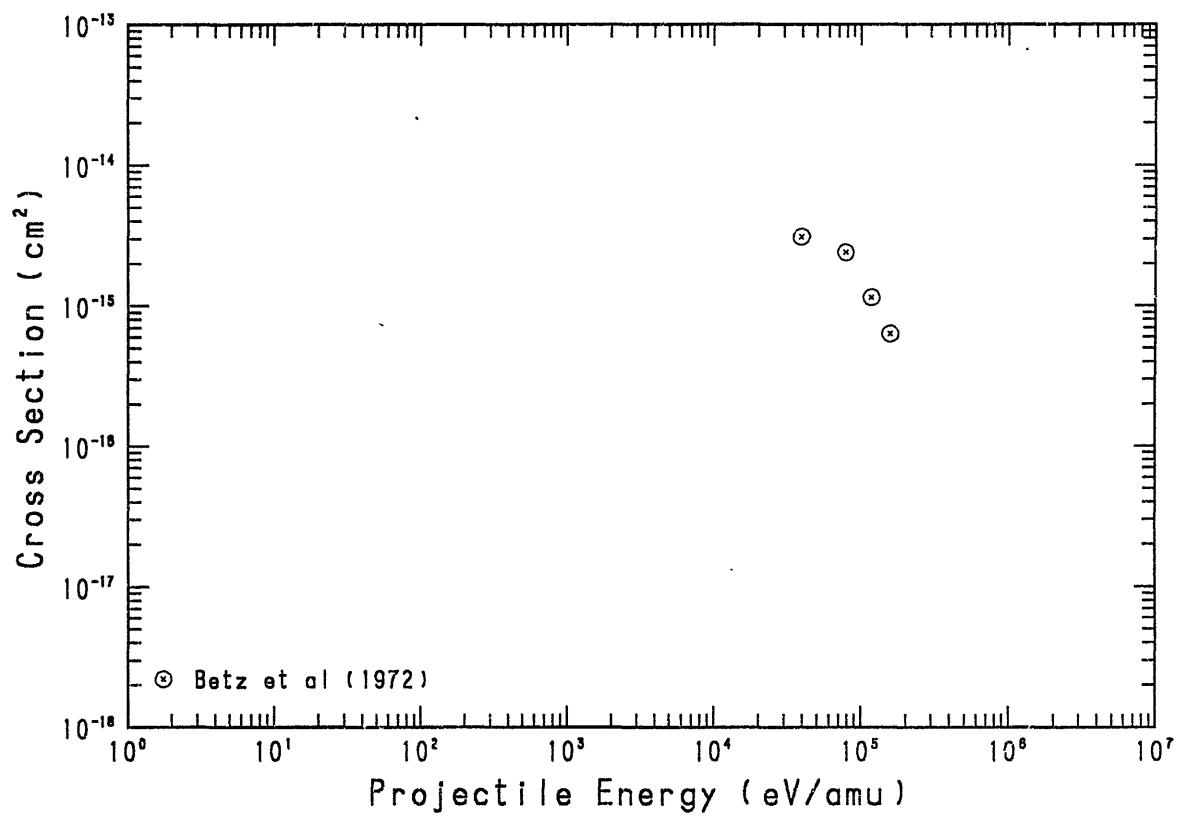


Fig. 181 $\text{I}^{10+} + \text{H}_2 \rightarrow \text{I}^{8+}$

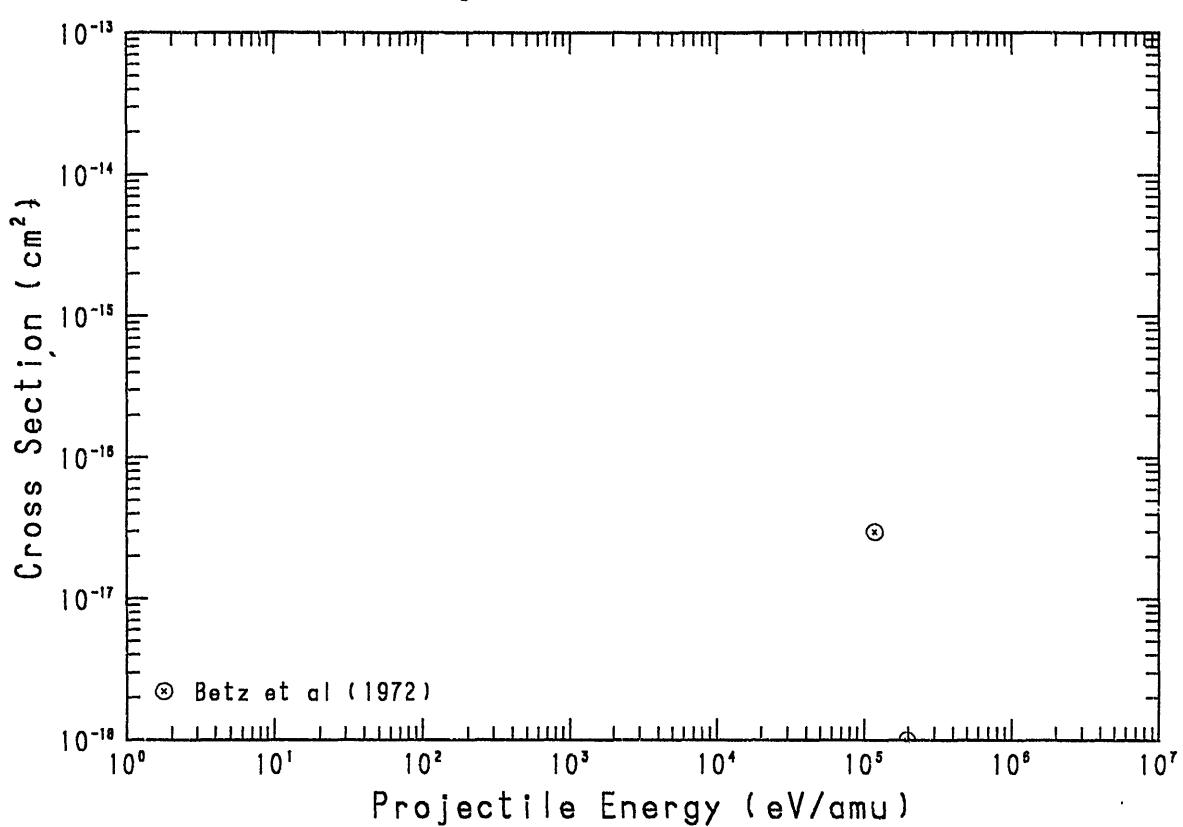


Fig. 182 $\text{I}^{10+} + \text{H}_2 \rightarrow \text{I}^{9+}$

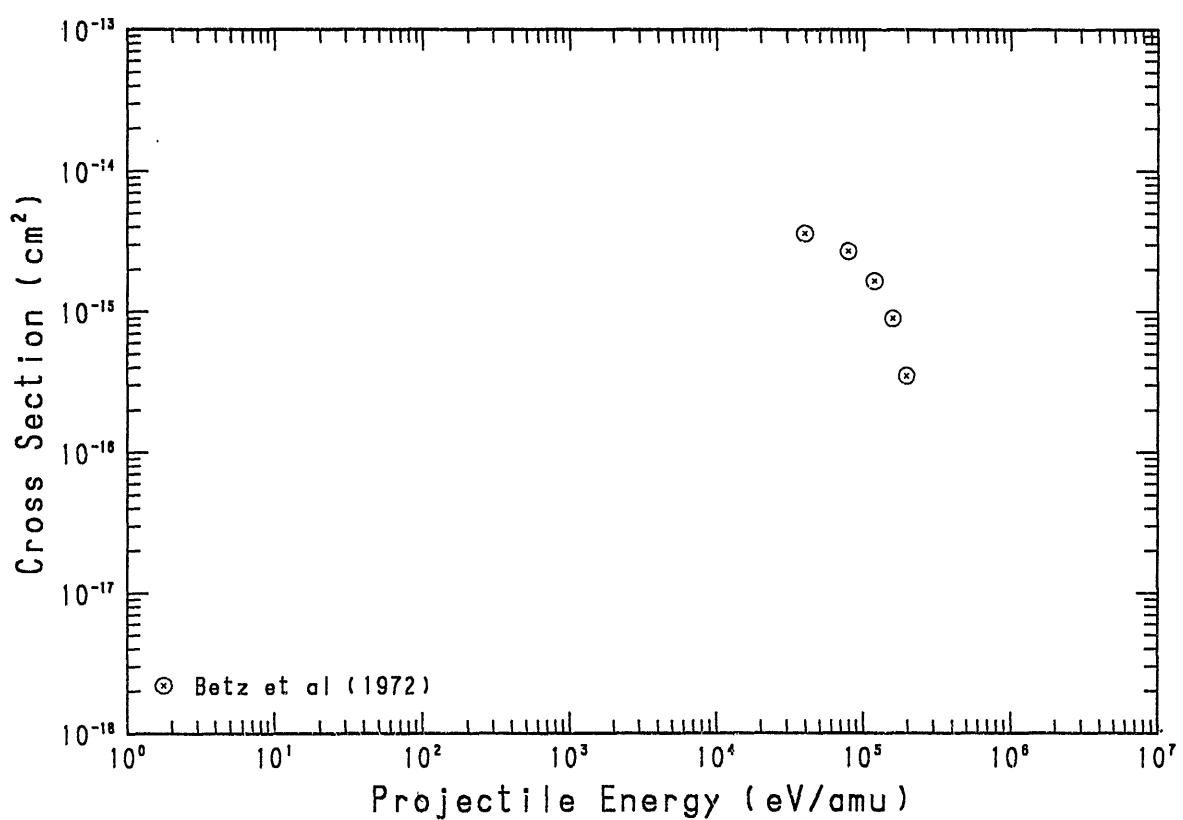


Fig.183 $I^{11+} + H_2 \rightarrow I^{10+}$

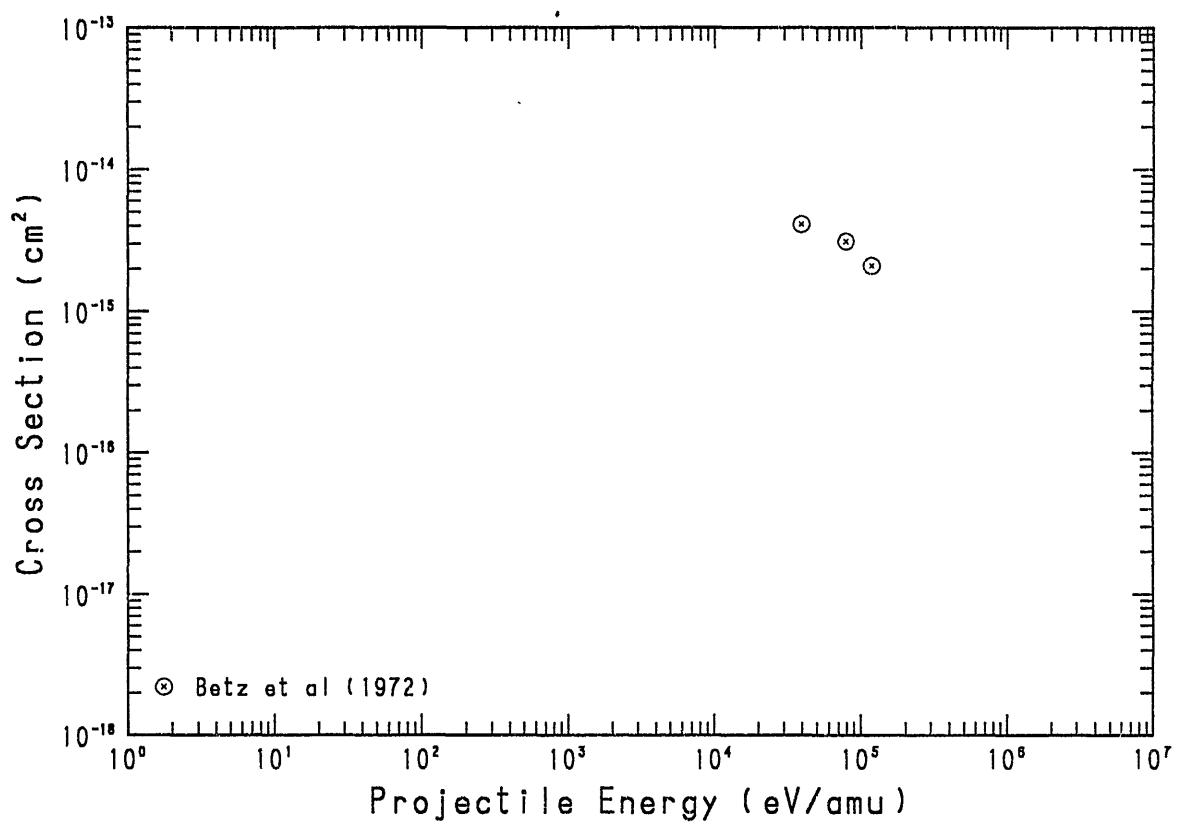


Fig.184 $I^{12+} + H_2 \rightarrow I^{11+}$

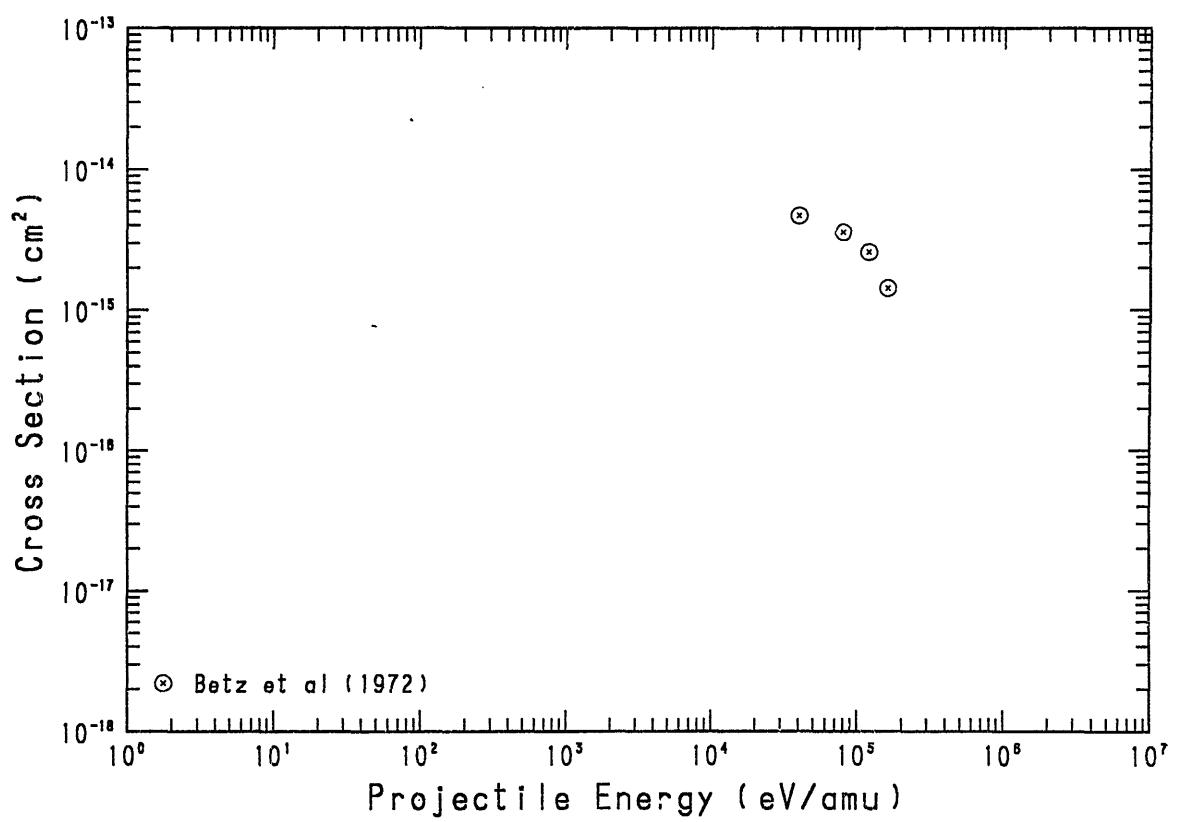


Fig. 185 $\text{I}^{13+} + \text{H}_2 \rightarrow \text{I}^{12+}$

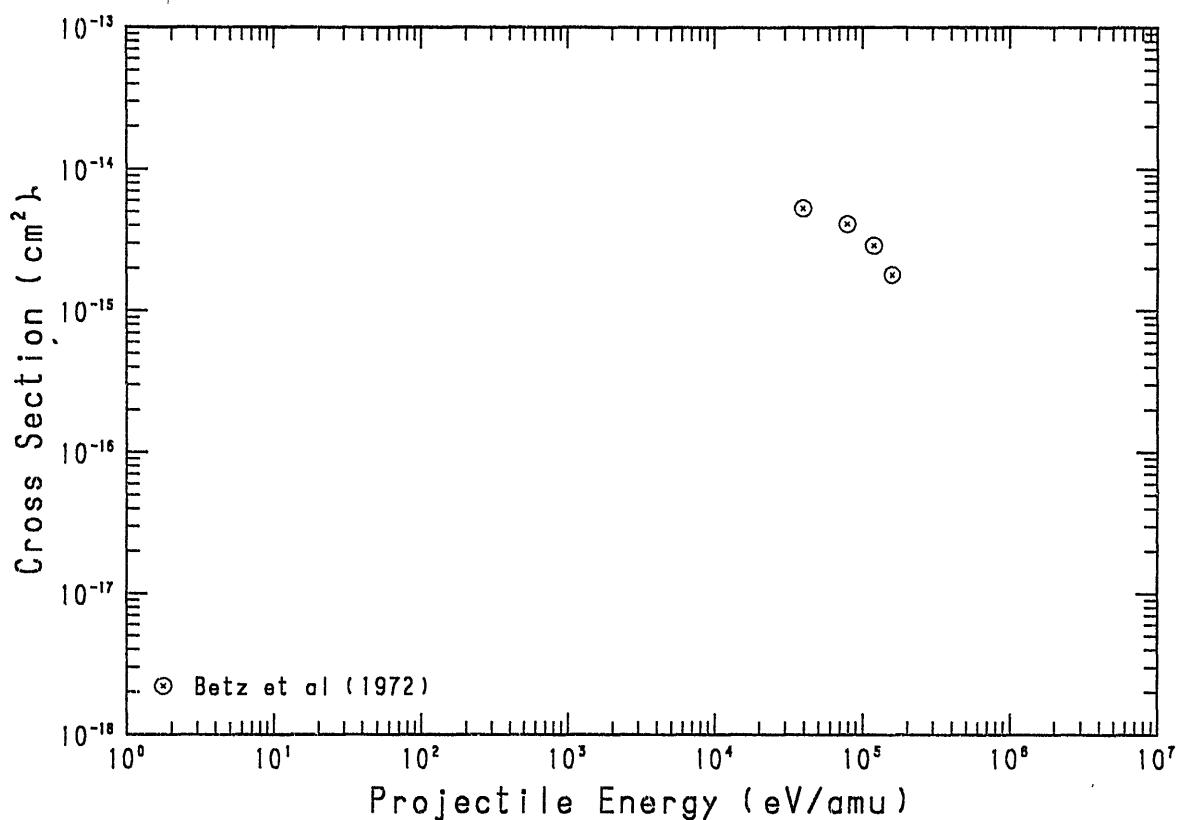


Fig. 186 $\text{I}^{14+} + \text{H}_2 \rightarrow \text{I}^{13+}$

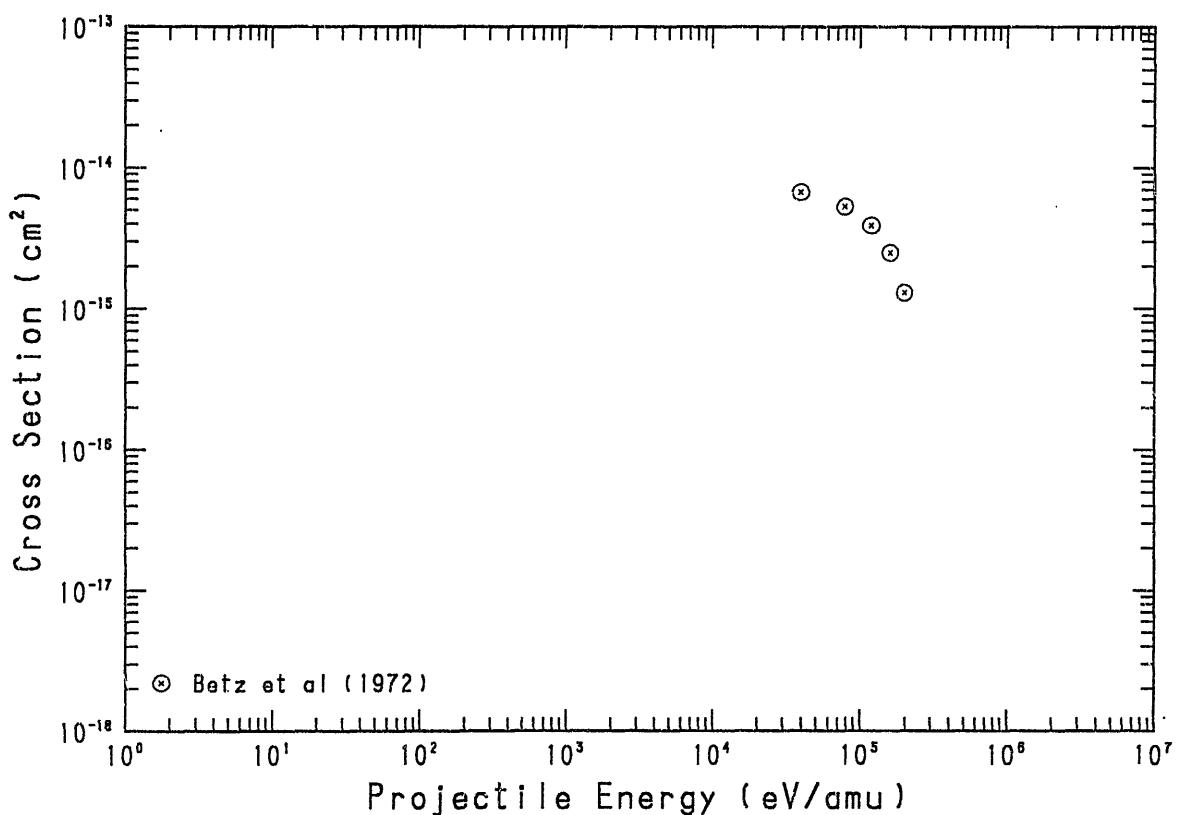


Fig. 187 $I^{15+} + H_2 \rightarrow I^{14+}$

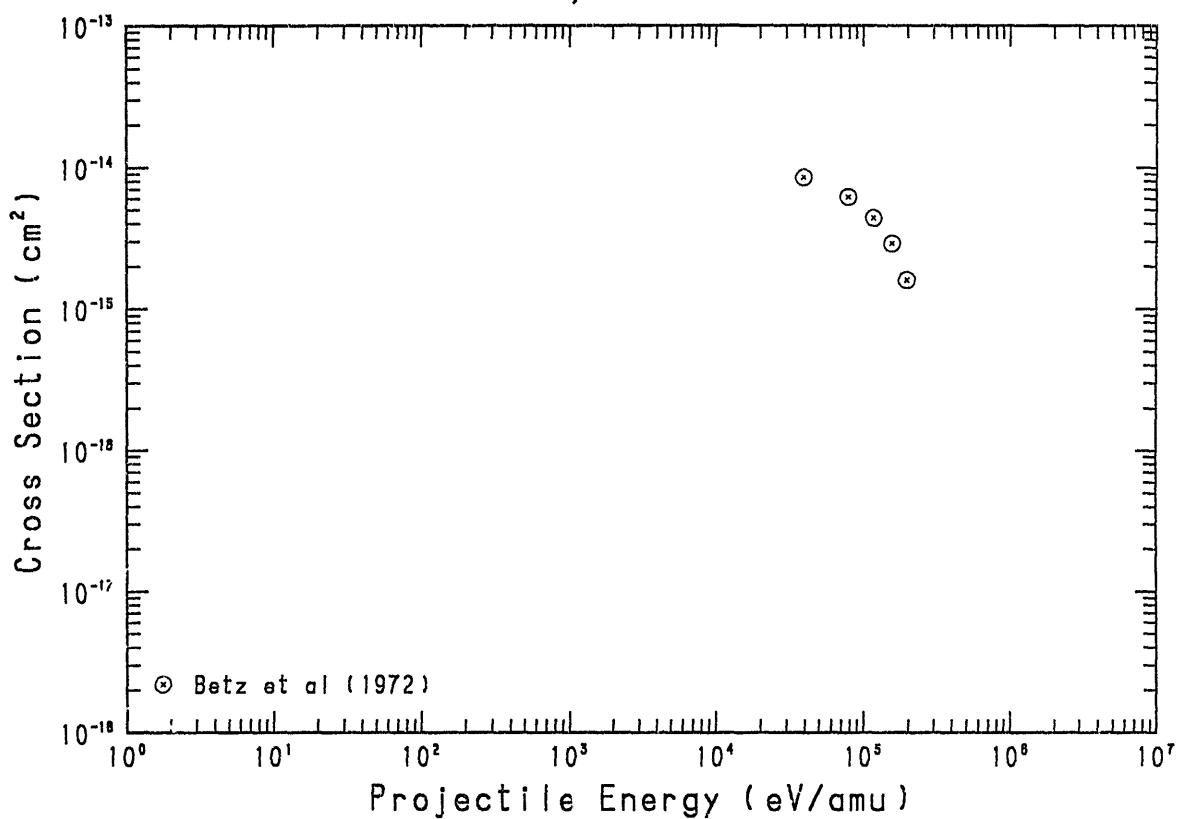


Fig. 188 $I^{16+} + H_2 \rightarrow I^{15+}$

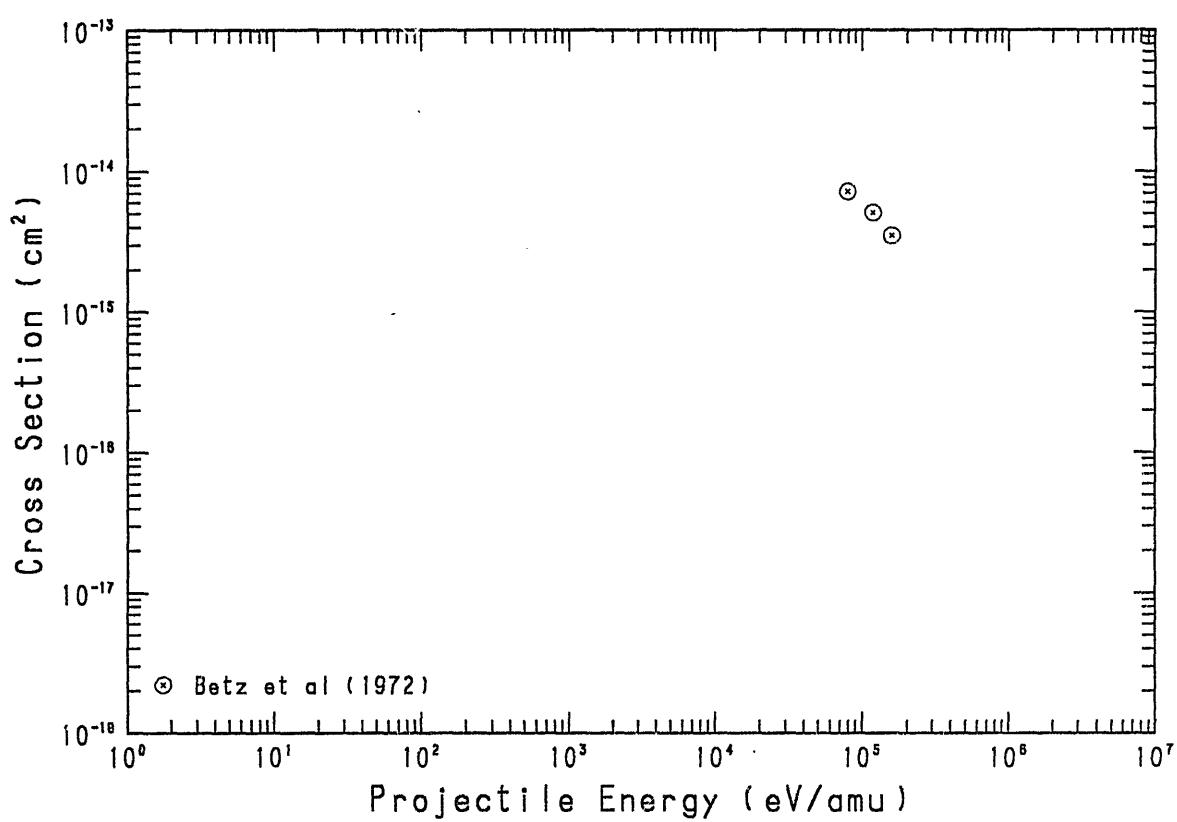


Fig. 189 $I^{17+} + H_2 \rightarrow I^{16+}$

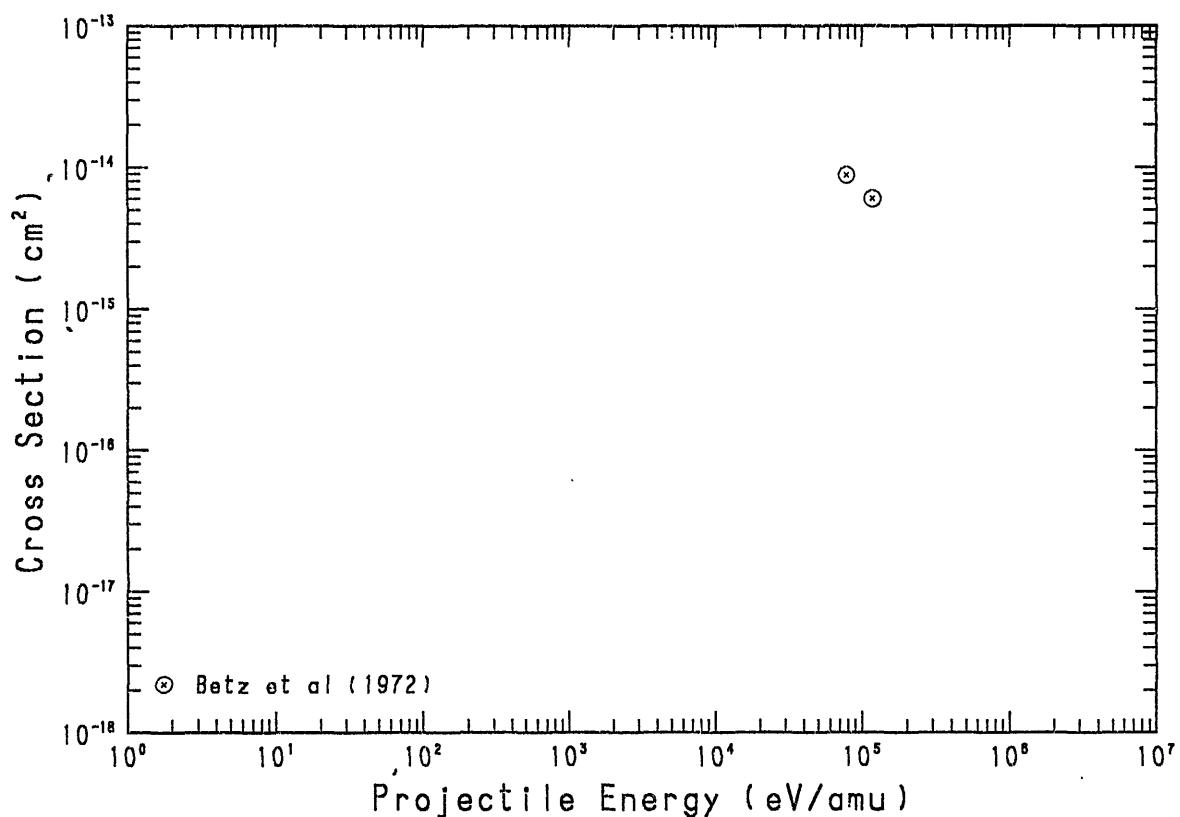


Fig. 190 $I^{18+} + H_2 \rightarrow I^{17+}$

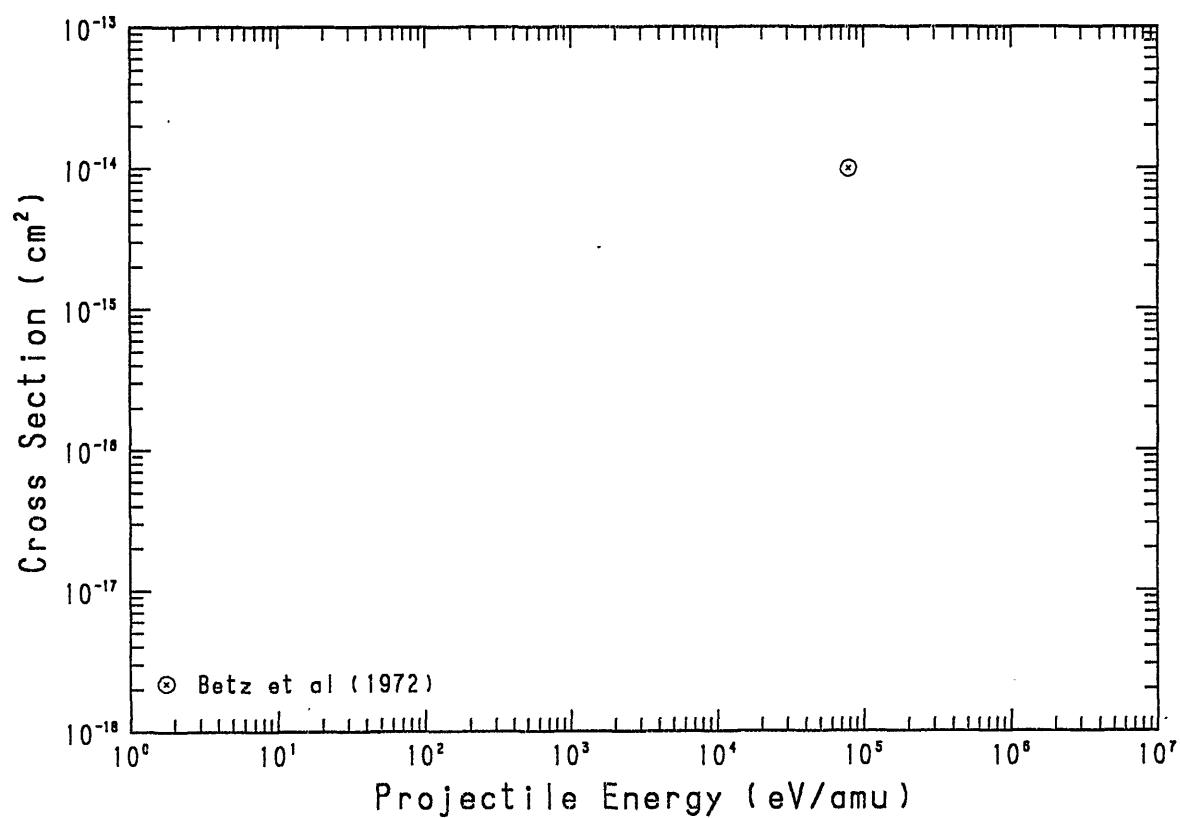


Fig. 191 $\text{Xe}^{2+} + \text{H}_2 \rightarrow \text{Xe}^+$

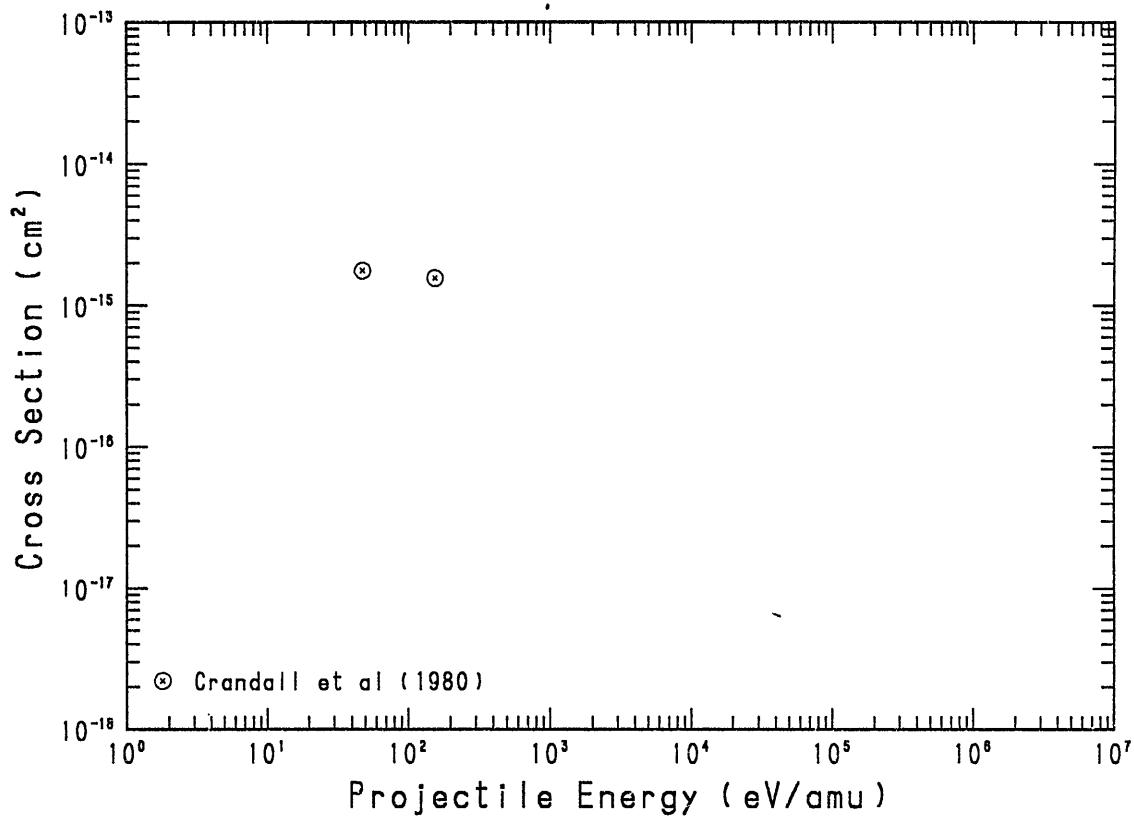


Fig. 192 $\text{Xe}^{3+} + \text{H}_2 \rightarrow \text{Xe}^{2+}$

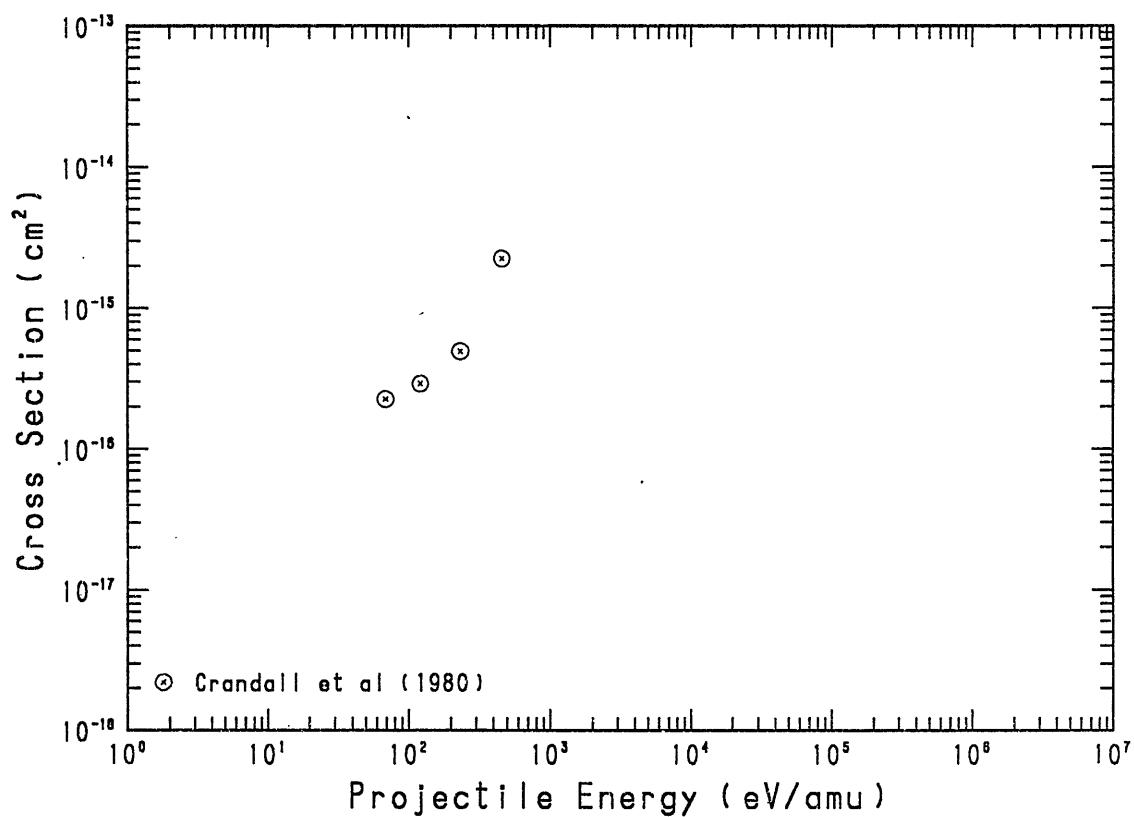


Fig. 193 $Xe^{4+} + H_2 \rightarrow Xe^{3+}$

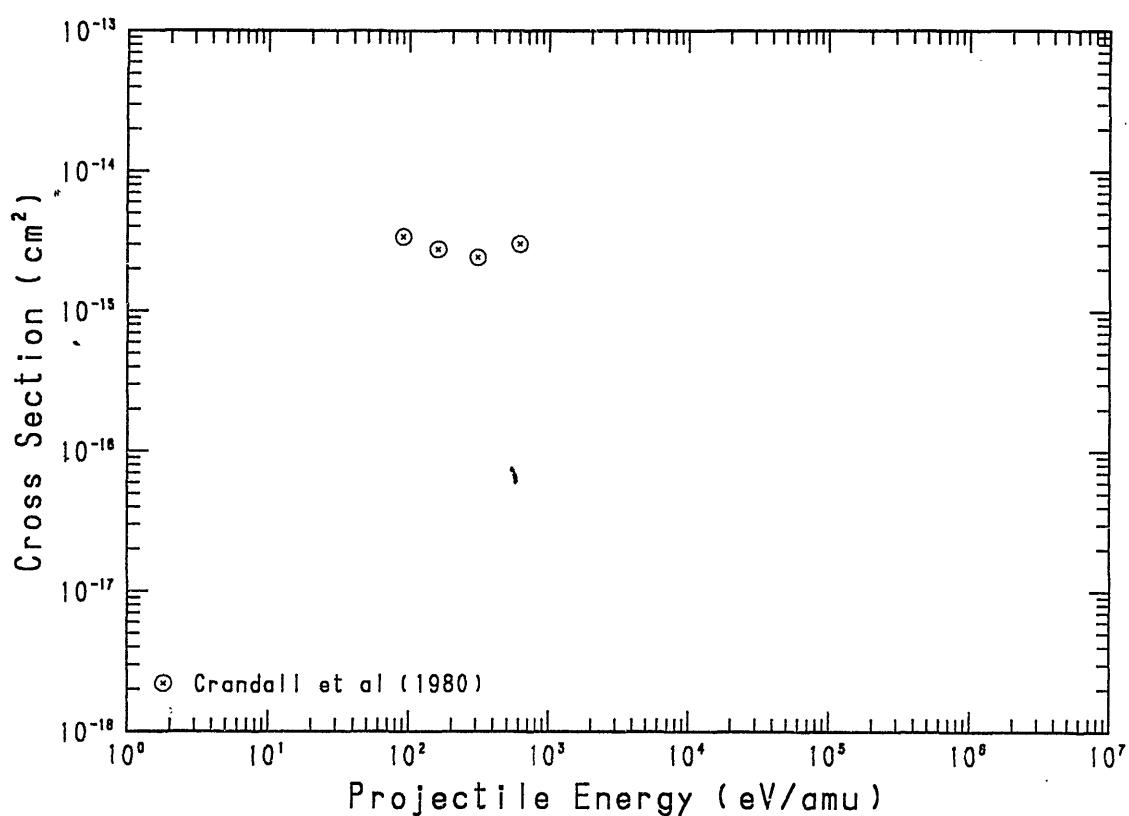


Fig. 194 $Xe^{5+} + H_2 \rightarrow Xe^{4+}$

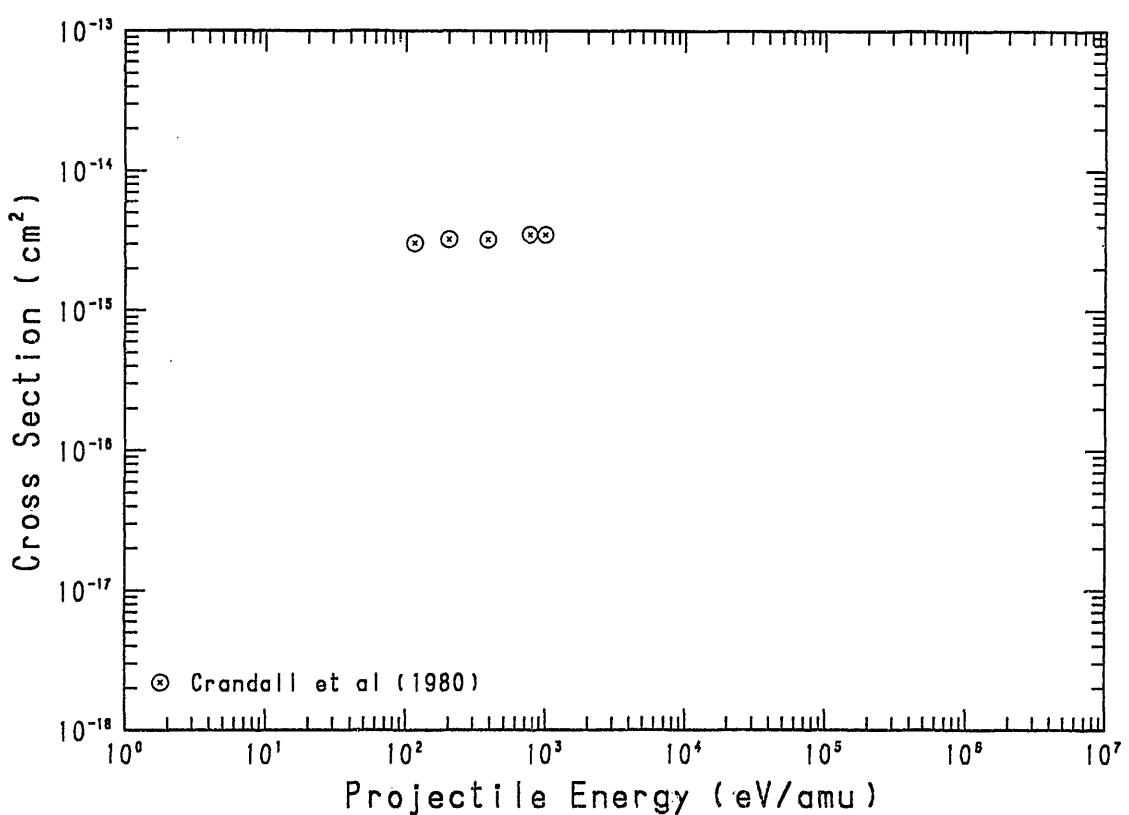


Fig. 195 $Xe^{6+} + H_2 \rightarrow Xe^{5+}$

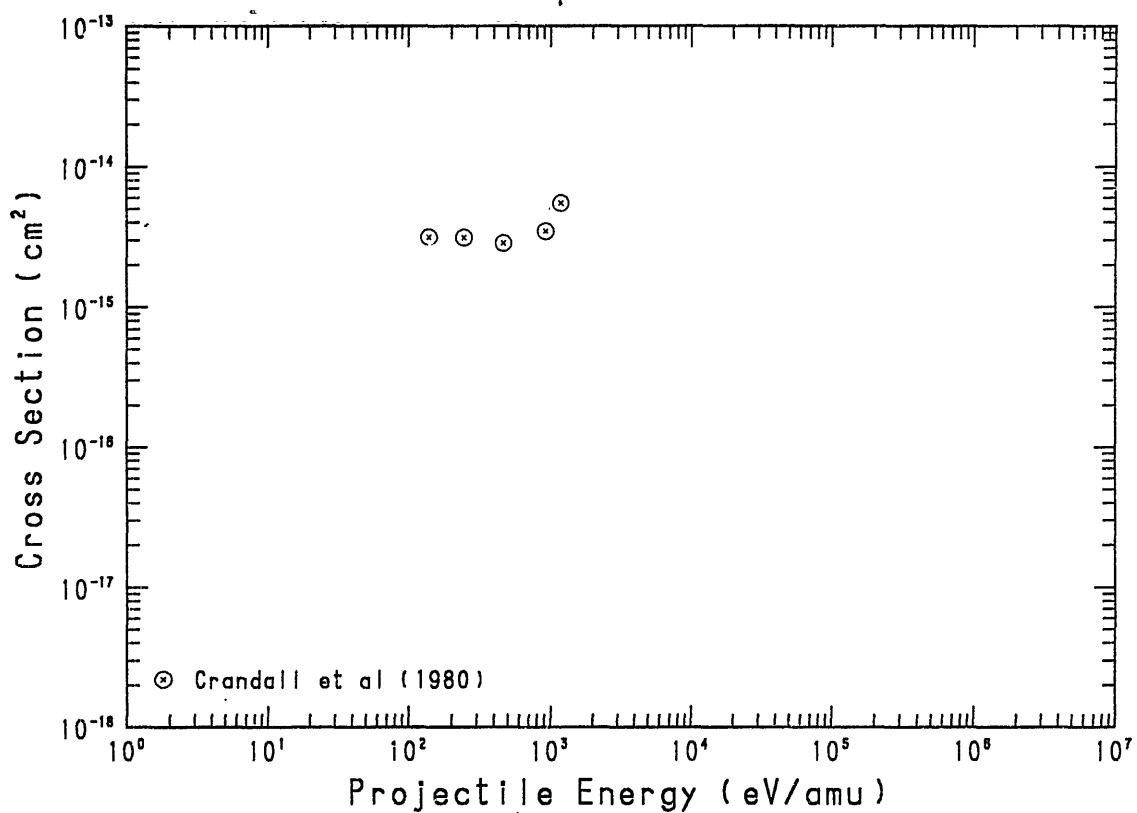


Fig. 196 $Xe^{7+} + H_2 \rightarrow Xe^{6+}$

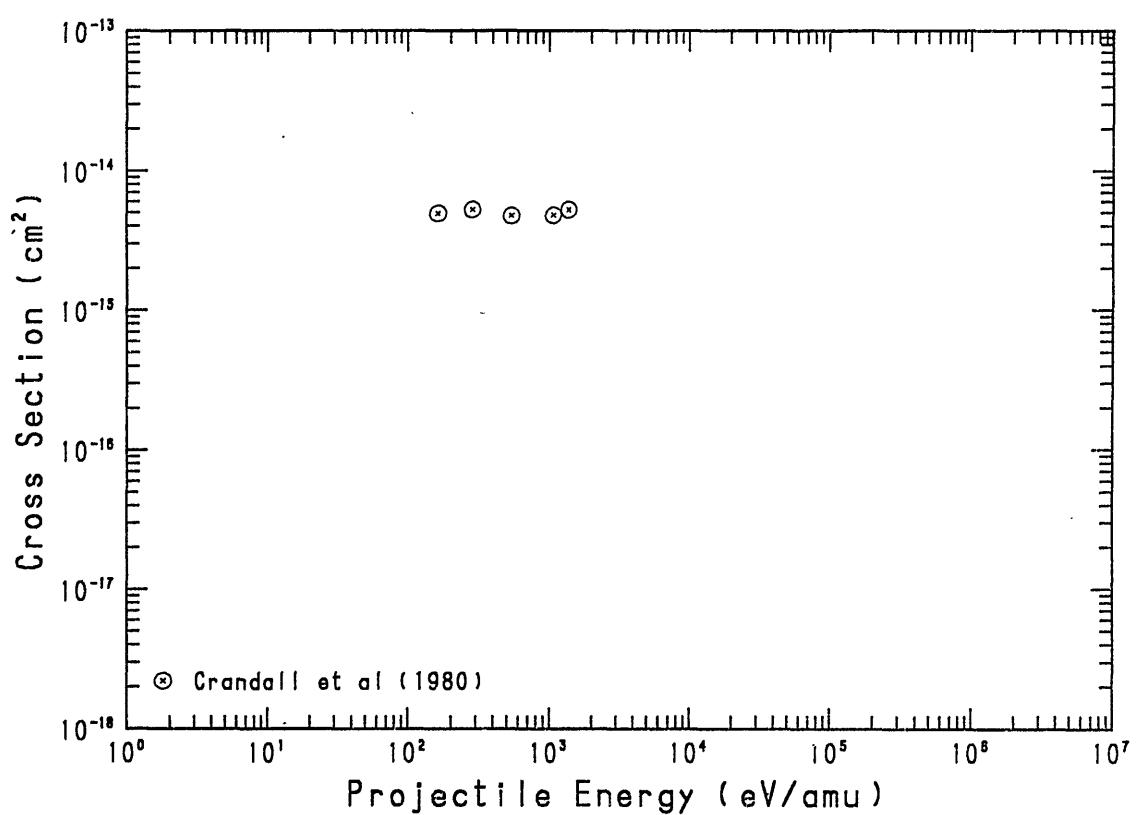


Fig. 197 $Xe^{8+} + H_2 \rightarrow Xe^{7+}$

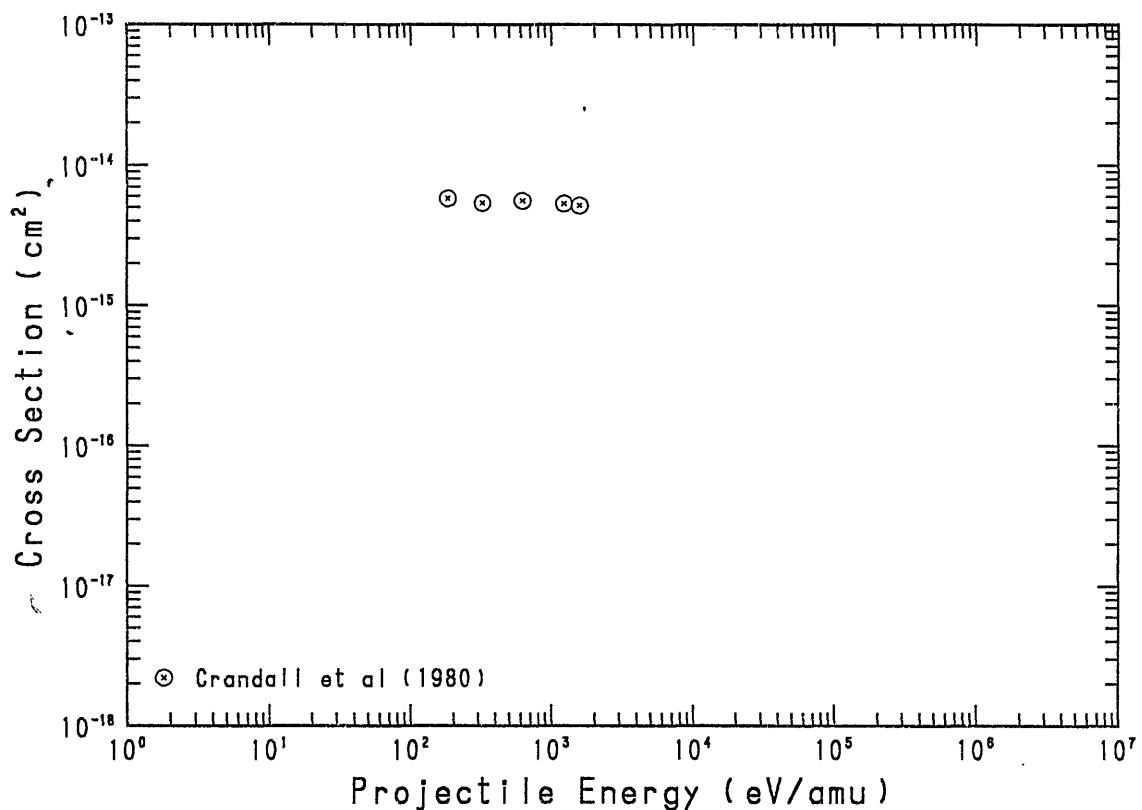


Fig. 198 $Xe^{8+} + H_2 \rightarrow Xe^{8+}$

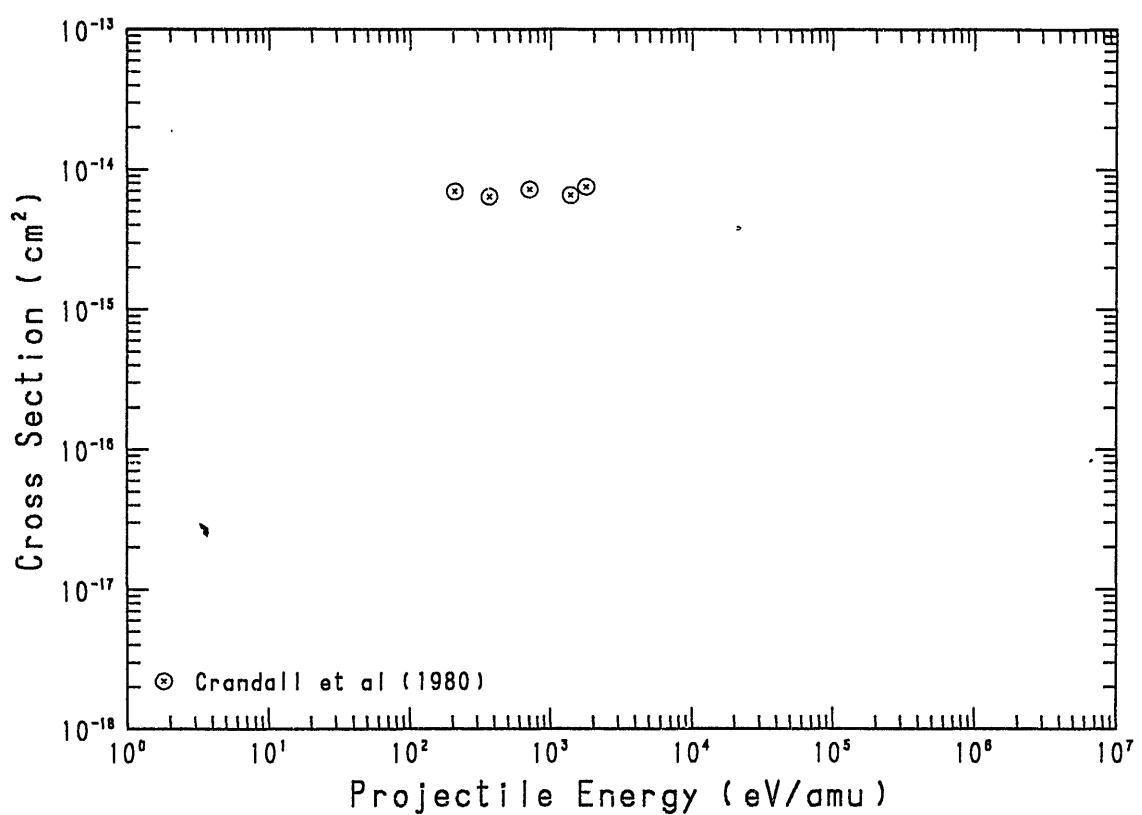


Fig.199 $\text{Xe}^{10+} + \text{H}_2 \rightarrow \text{Xe}^{9+}$

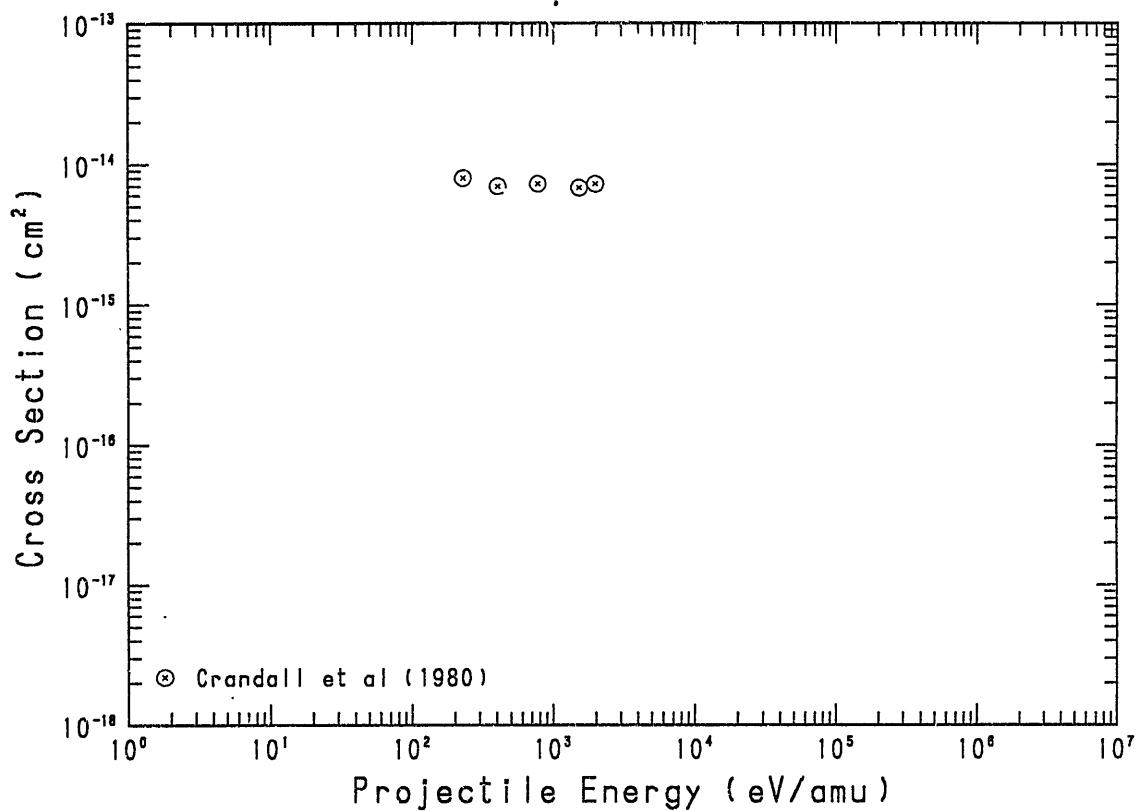


Fig.200 $\text{Xe}^{11+} + \text{H}_2 \rightarrow \text{Xe}^{10+}$

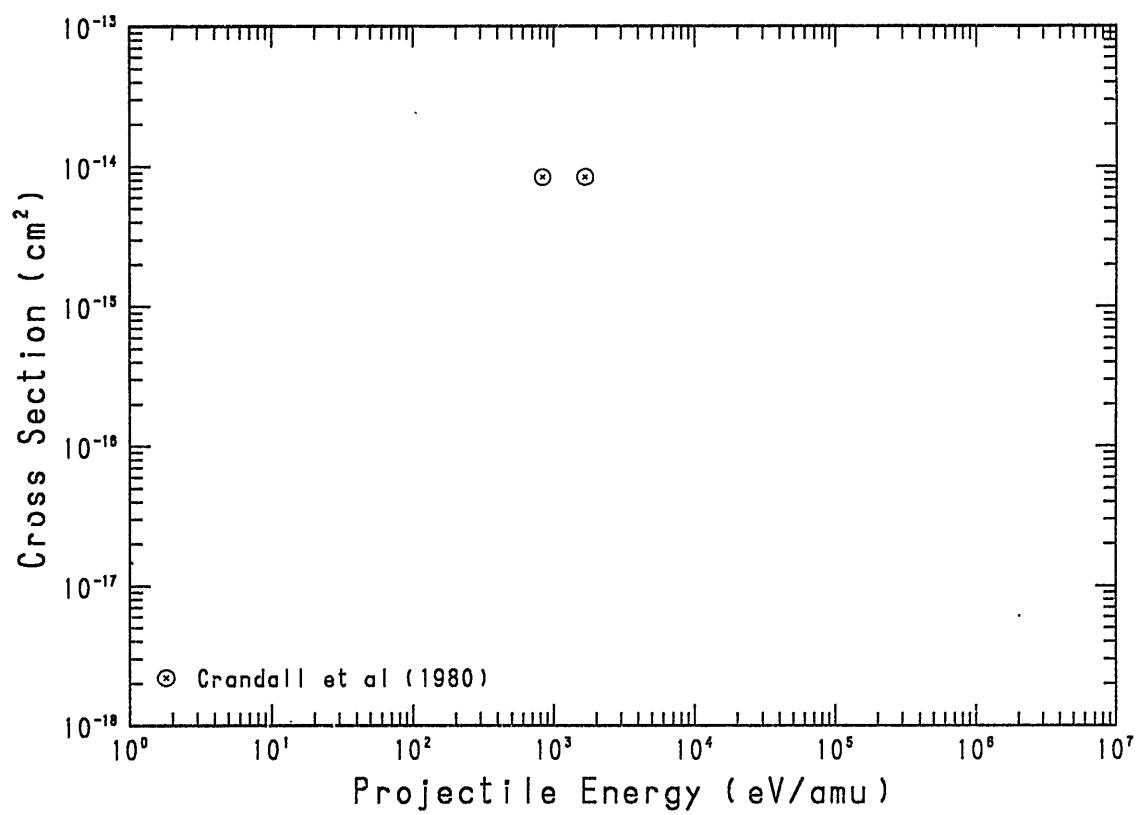


Fig. 201 $Xe^{12+} + H_2 \rightarrow Xe^{11+}$

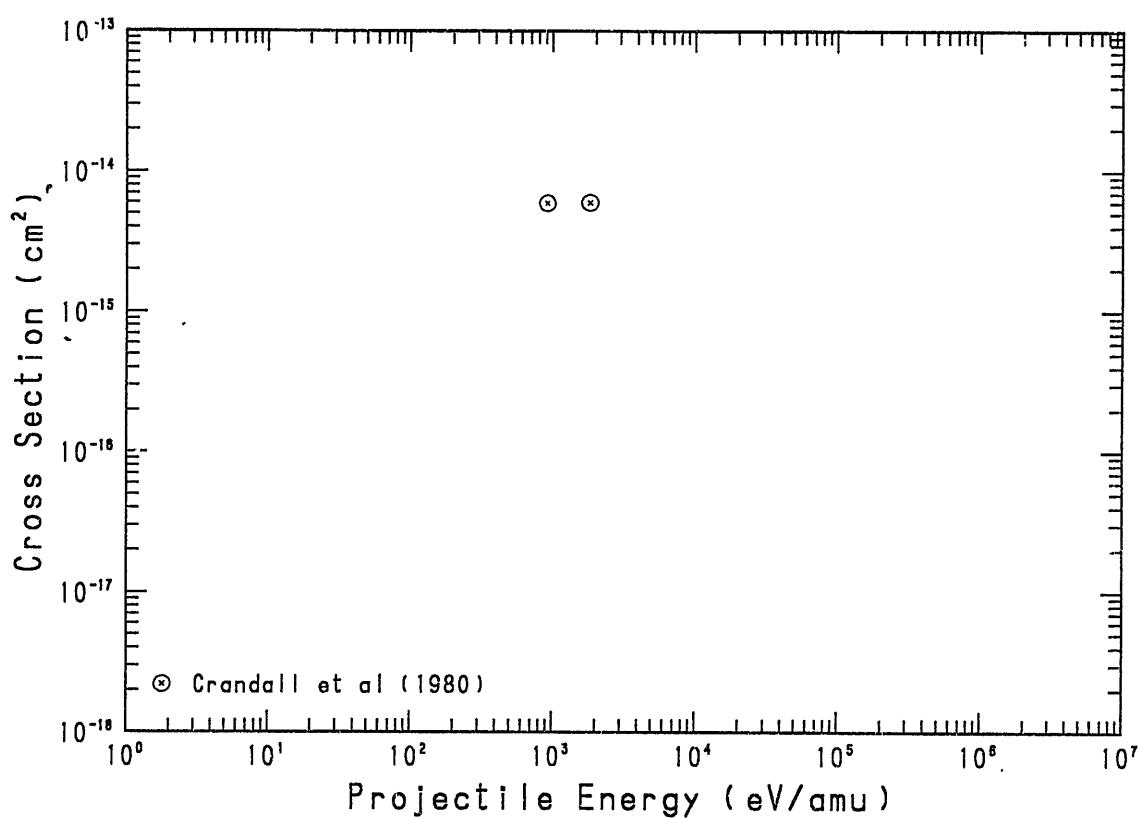


Fig. 202 $Cs^{2+} + H_2 \rightarrow Cs^+$

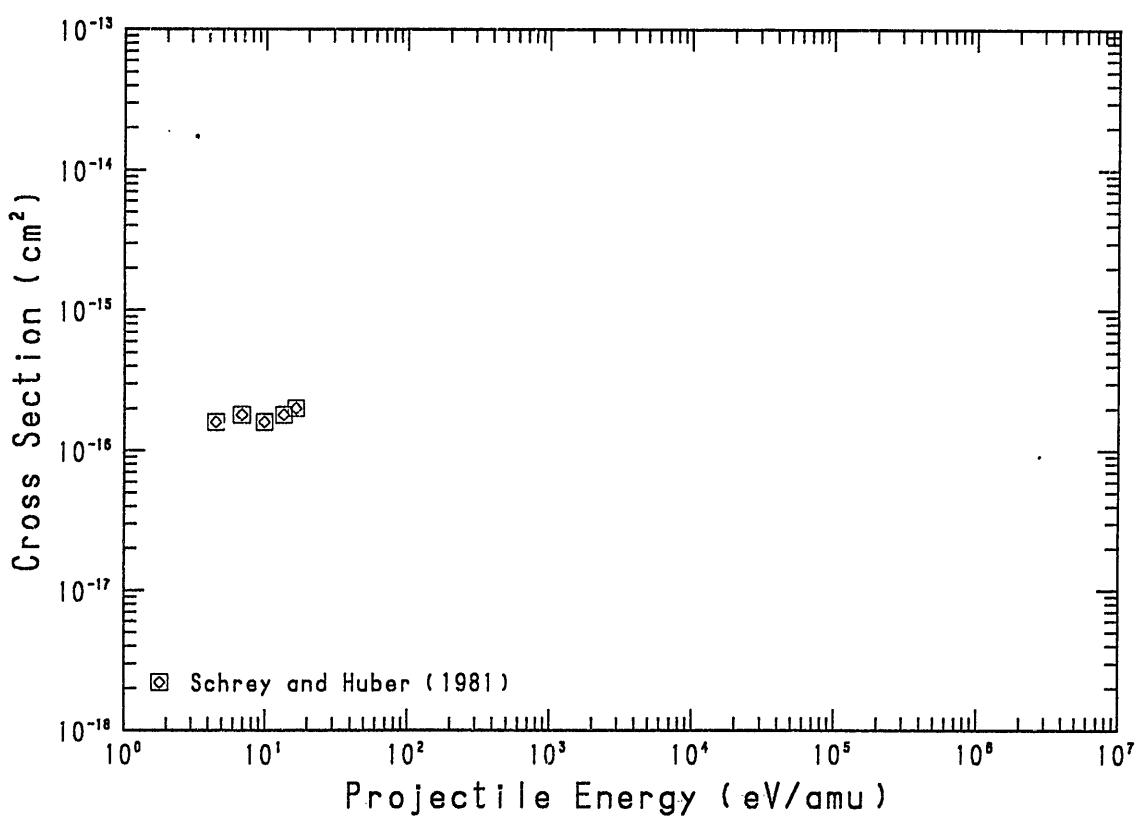


Fig. 203 $\text{Cs}^{3+} + \text{H}_2 \rightarrow \text{Cs}^+$

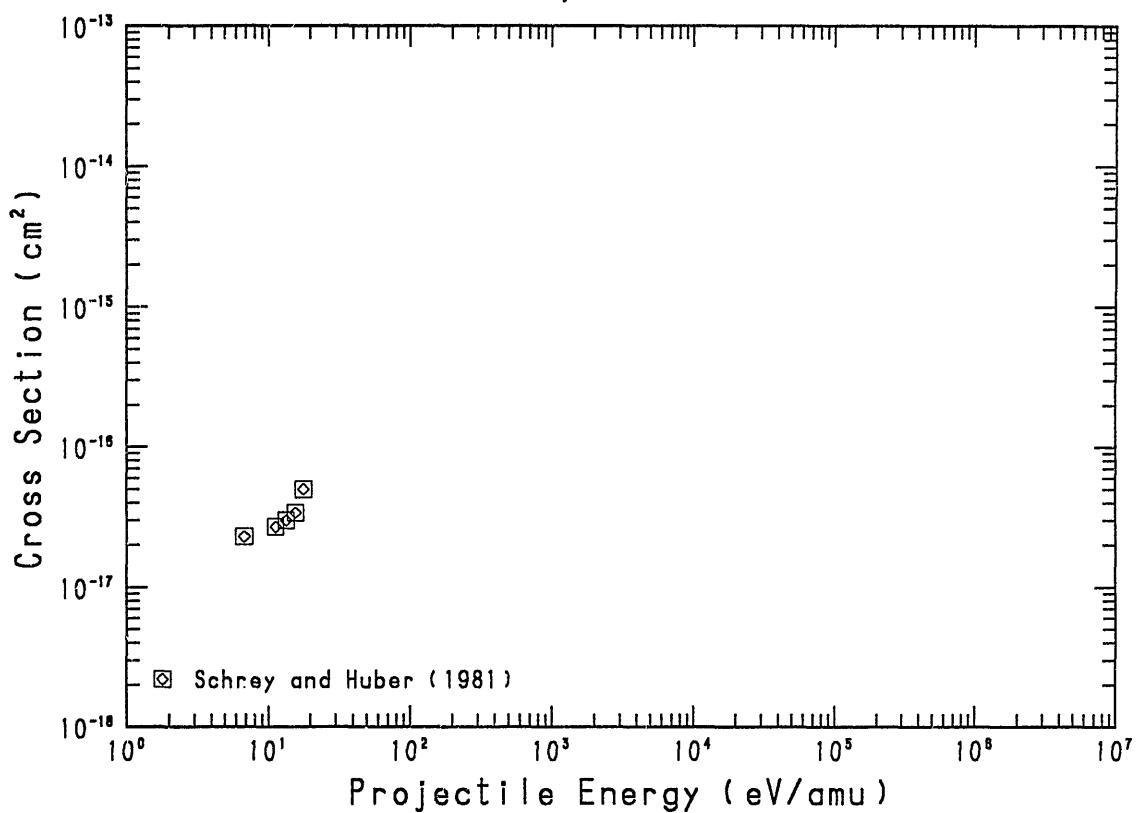


Fig. 204 $\text{Cs}^{3+} + \text{H}_2 \rightarrow \text{Cs}^{2+}$

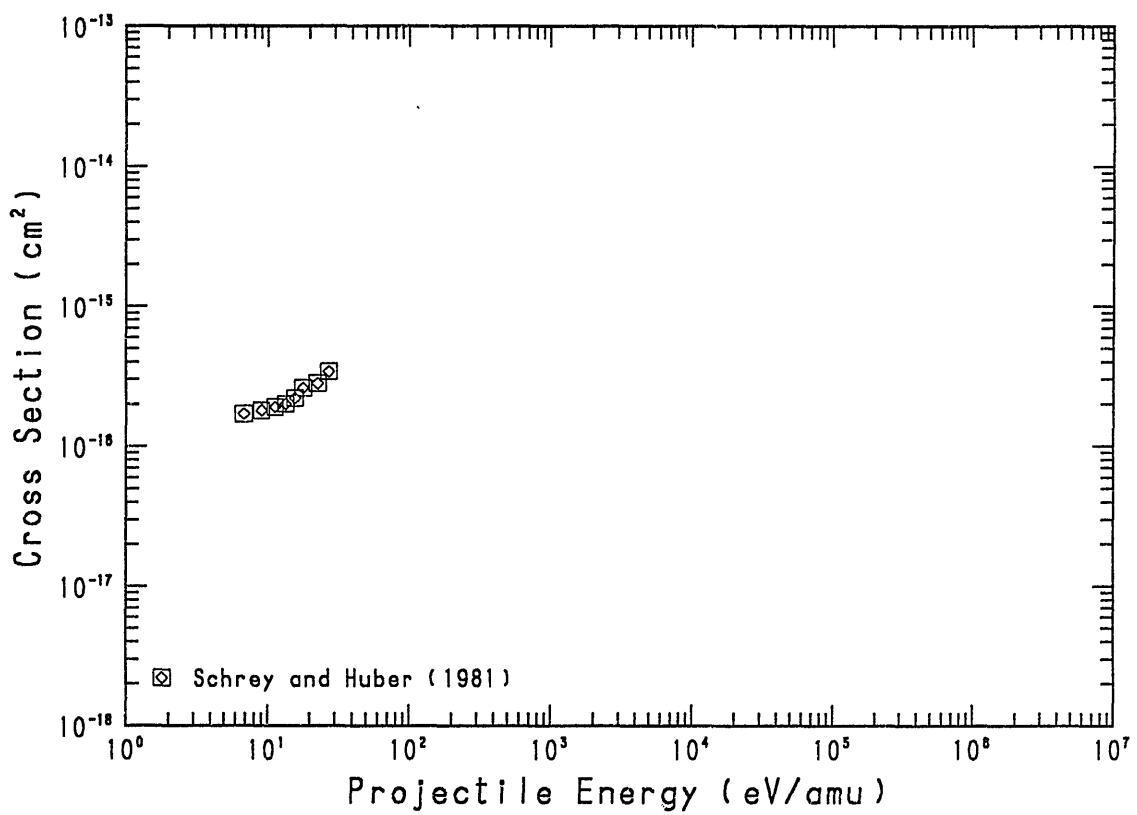


Fig.205 $\text{Cs}^{4+} + \text{H}_2 \rightarrow \text{Cs}^{2+}$

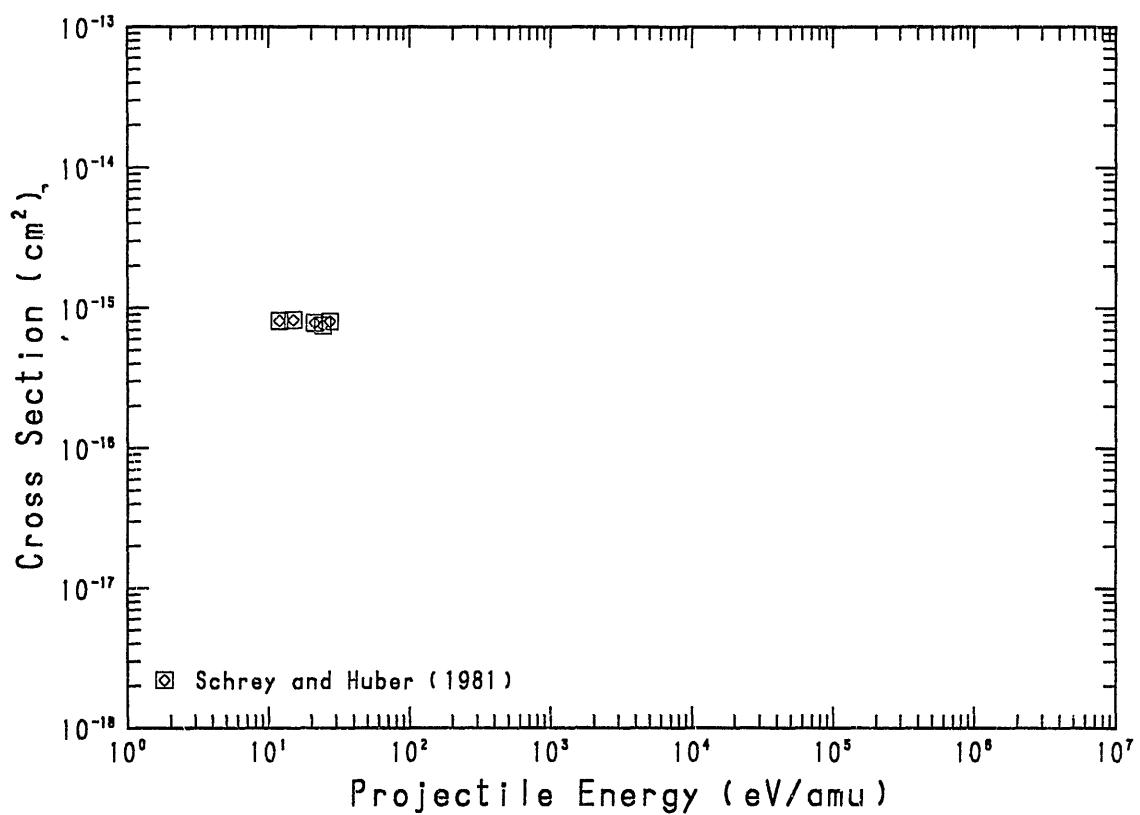


Fig.206 $\text{Cs}^{4+} + \text{H}_2 \rightarrow \text{Cs}^{3+}$

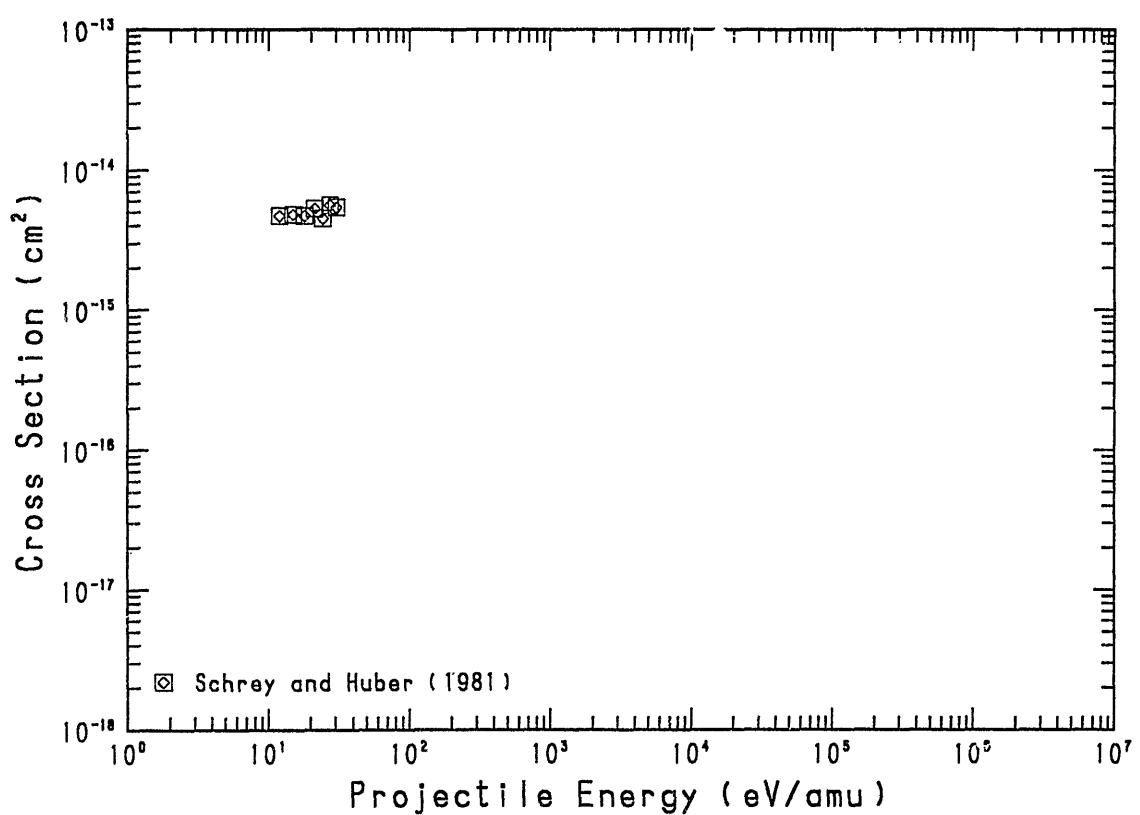


Fig.207 $\text{Cs}^{5+} + \text{H}_2 \rightarrow \text{Cs}^{3+}$

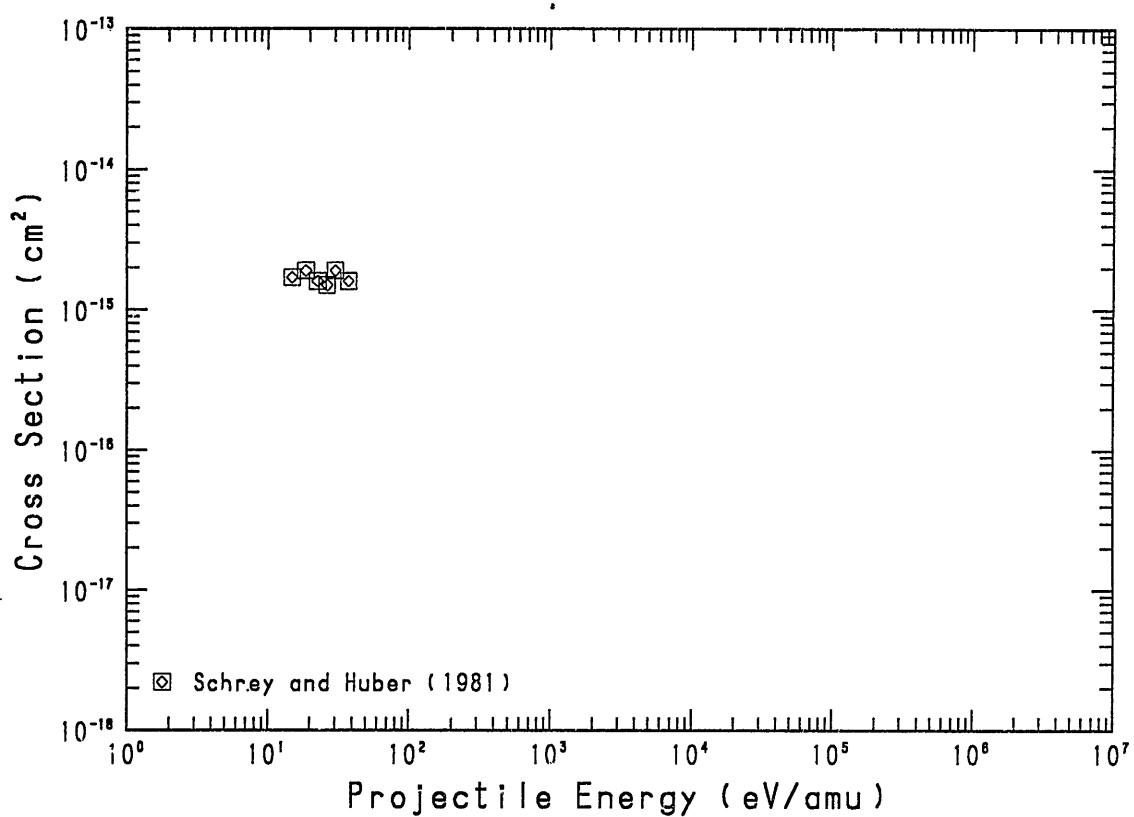


Fig.208 $\text{Cs}^{5+} + \text{H}_2 \rightarrow \text{Cs}^{4+}$

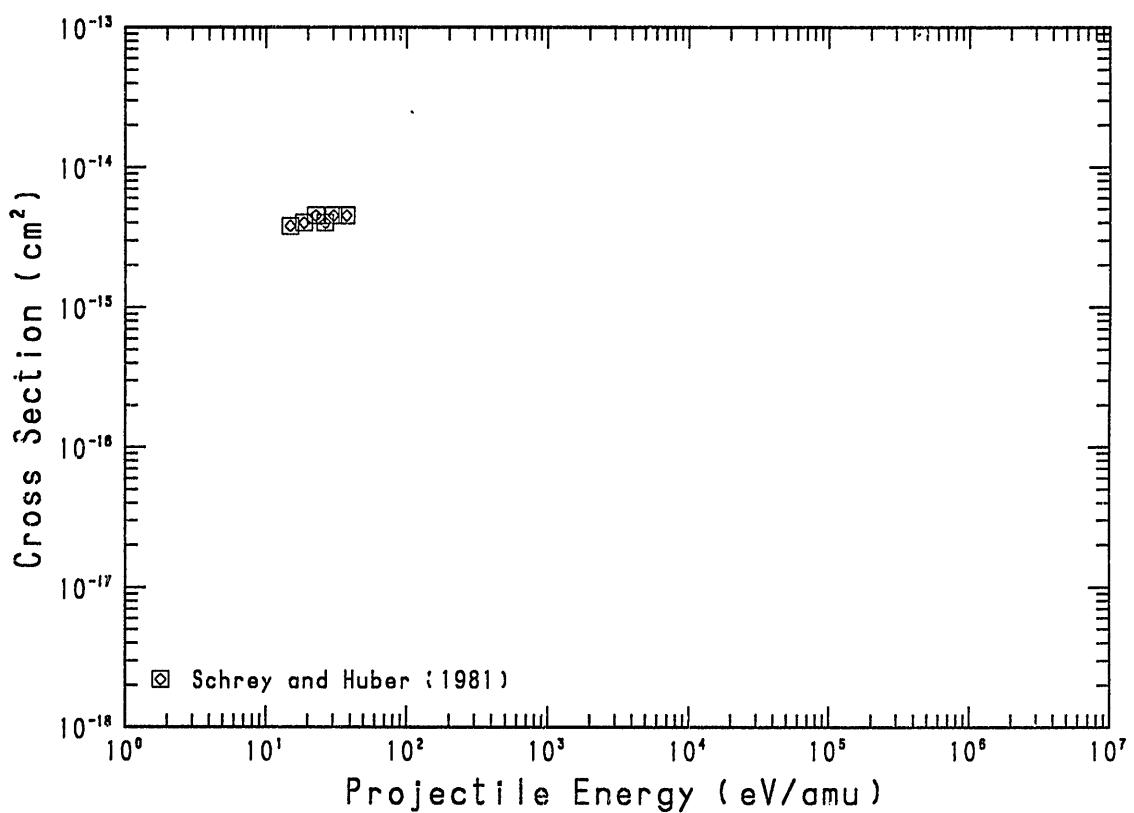


Fig. 209 $\text{Ba}^{2+} + \text{H}_2 \rightarrow \text{Ba}^+$

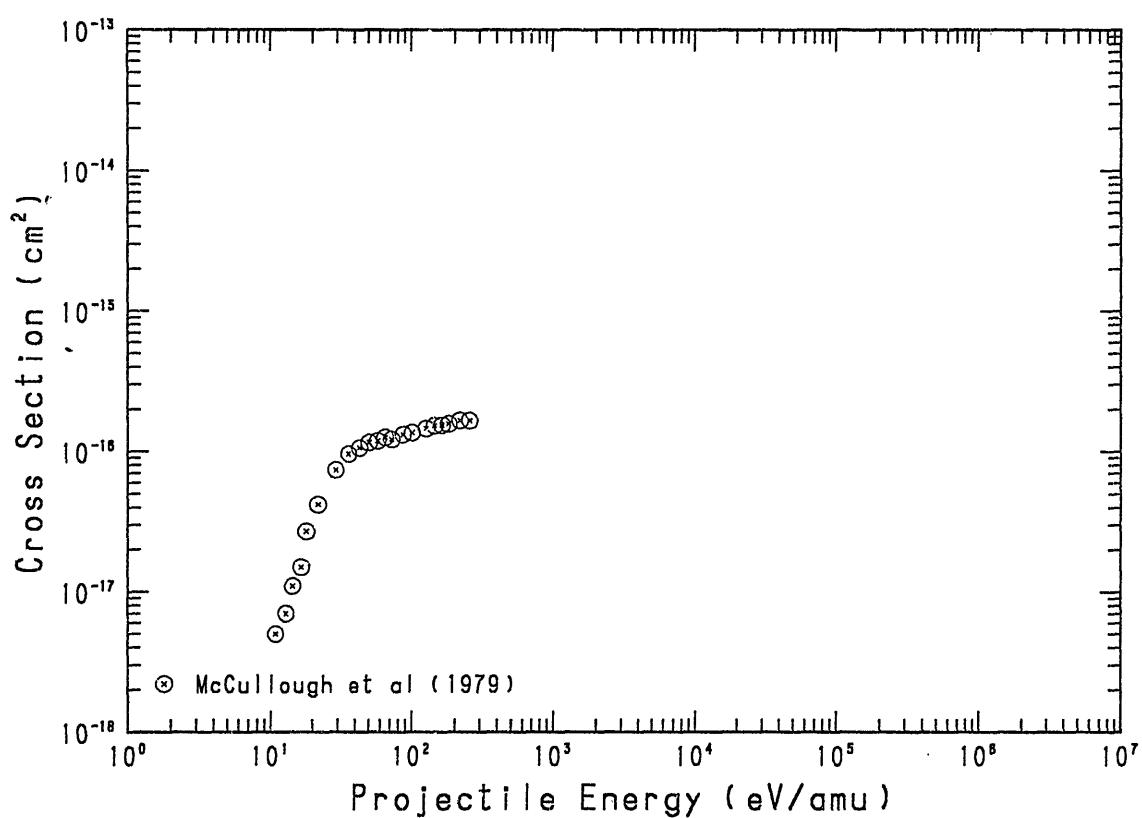


Fig. 210 $\text{Ta}^{3+} + \text{H}_2 \rightarrow \text{Ta}^{2+}$

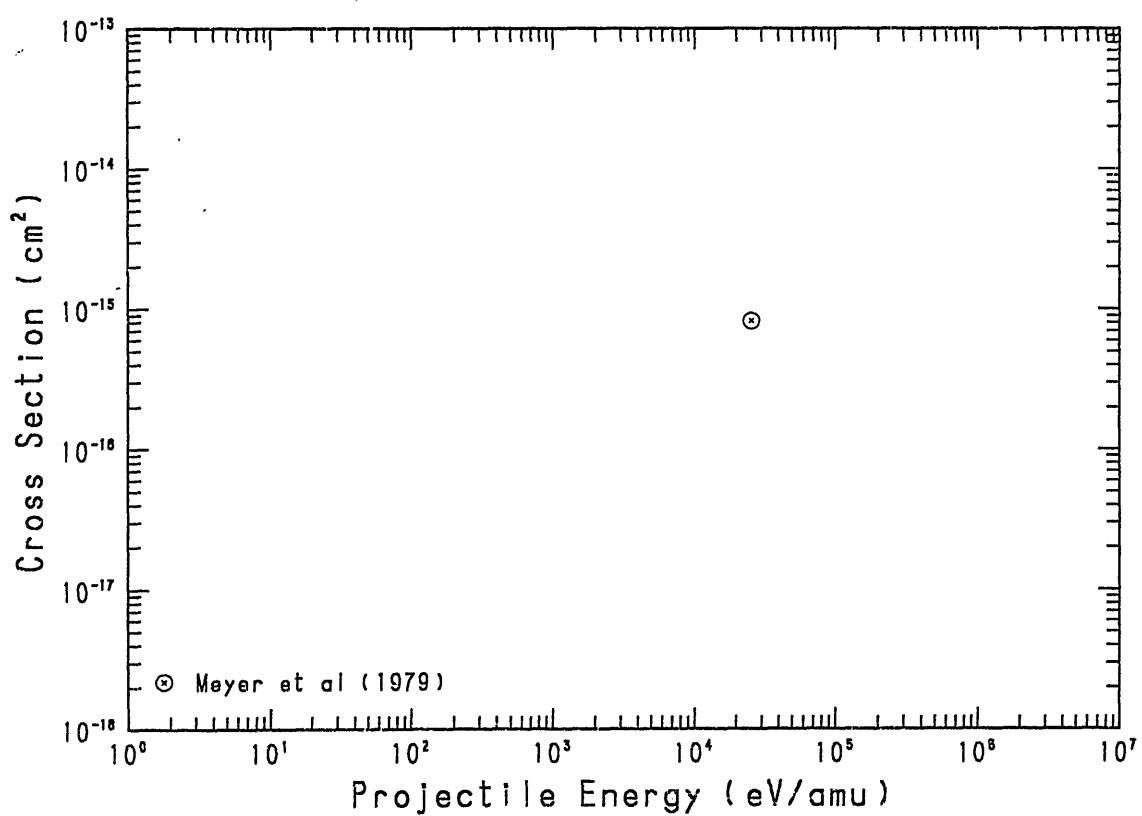


Fig. 211 $Ta^{4+} + H_2 \rightarrow Ta^{3+}$

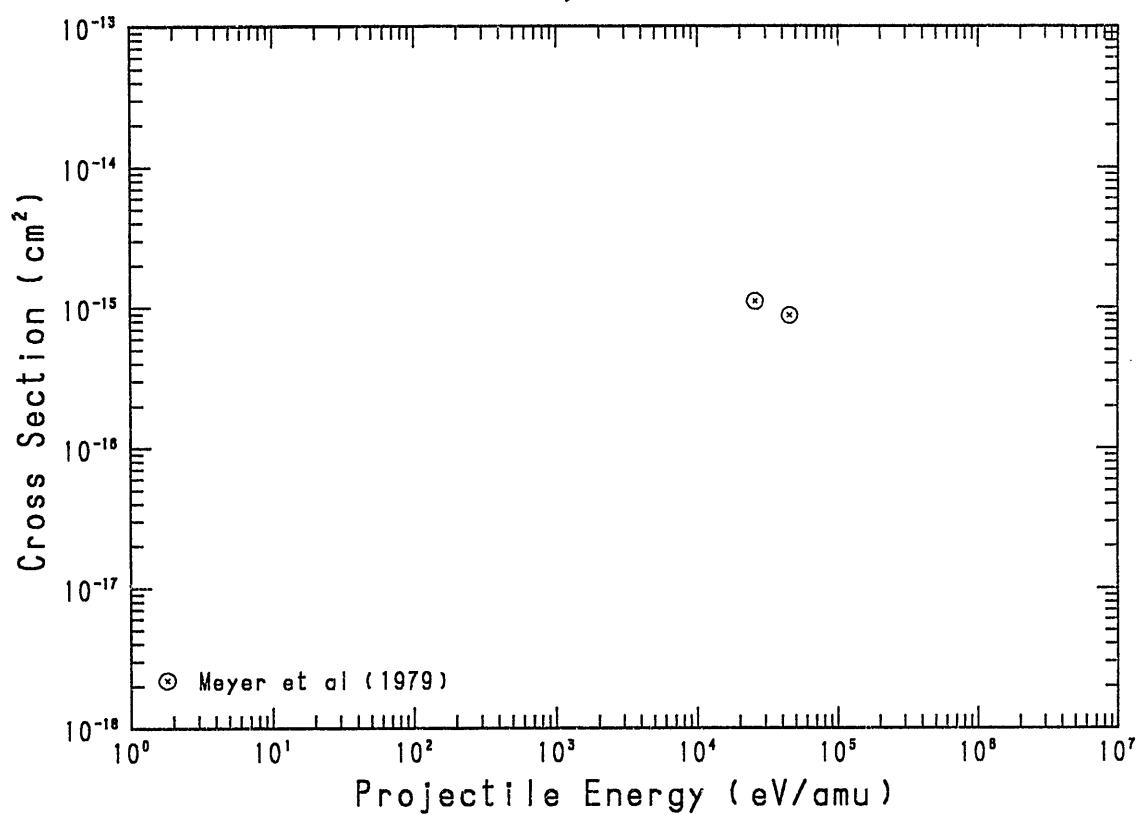


Fig. 212 $Ta^{5+} + H_2 \rightarrow Ta^{4+}$

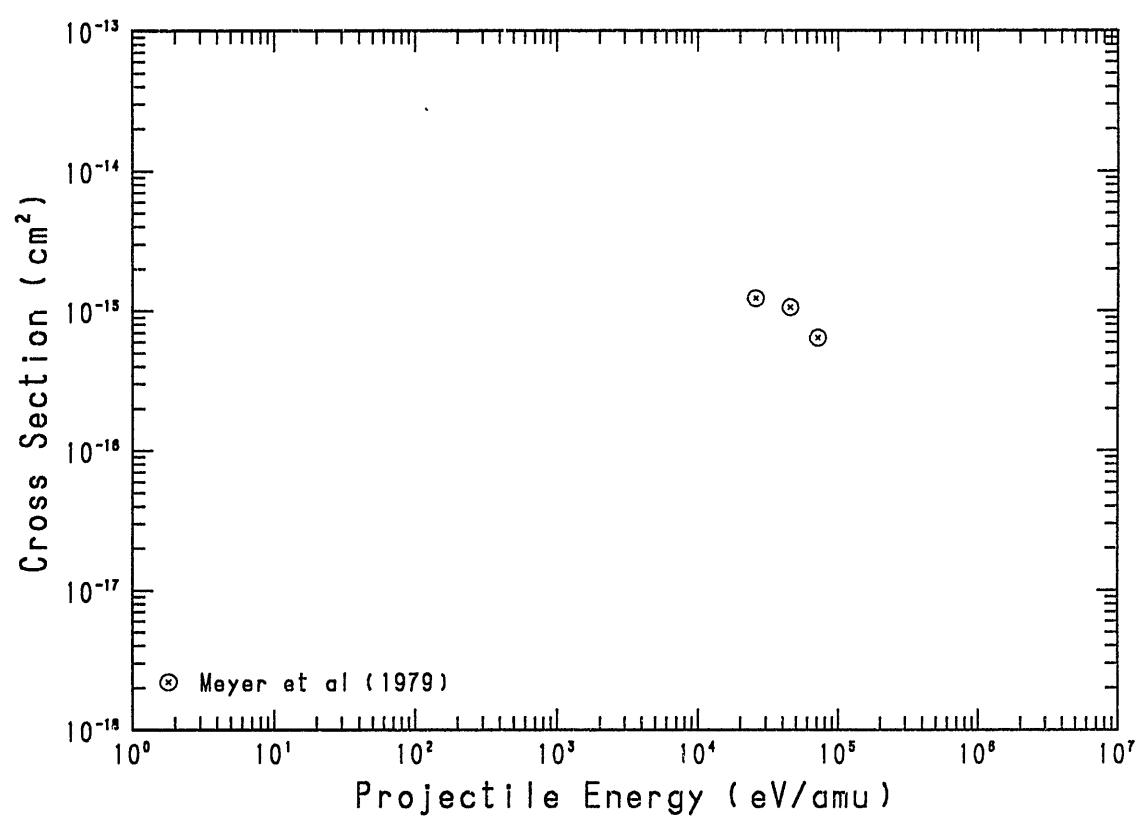


Fig. 213 $Ta^{6+} + H_2 \rightarrow Ta^{5+}$

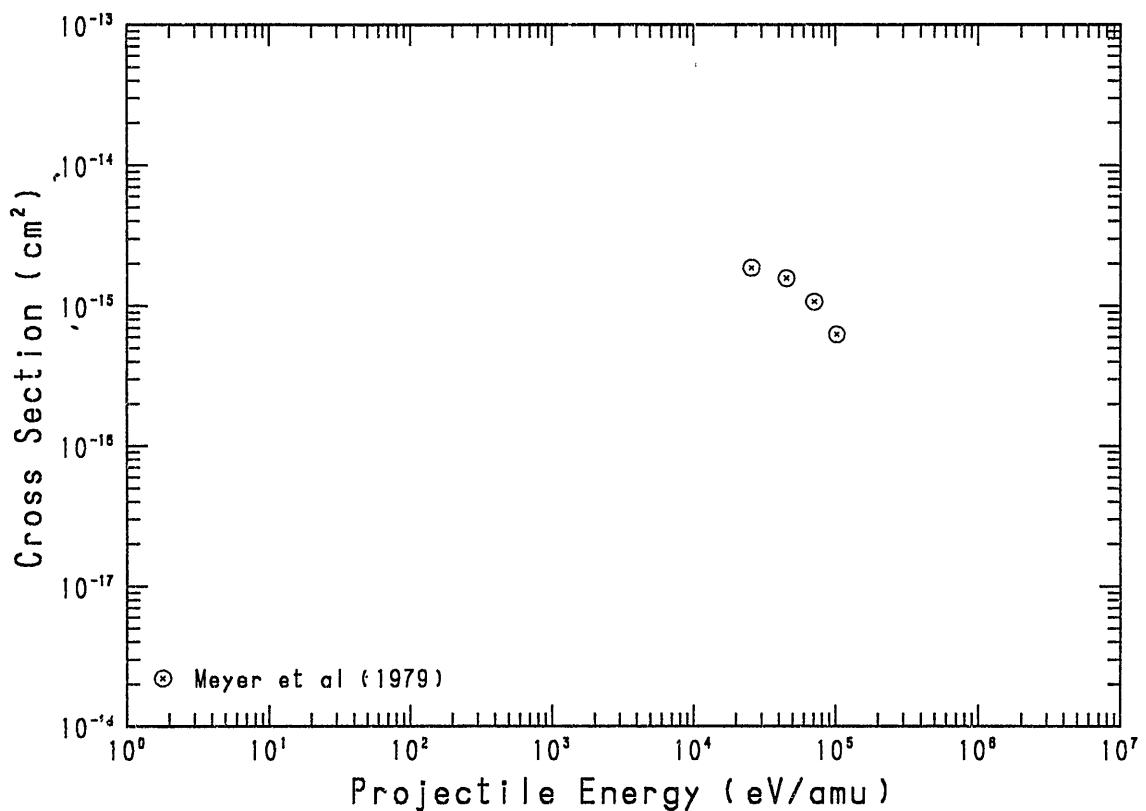


Fig. 214 $Ta^{7+} + H_2 \rightarrow Ta^{6+}$

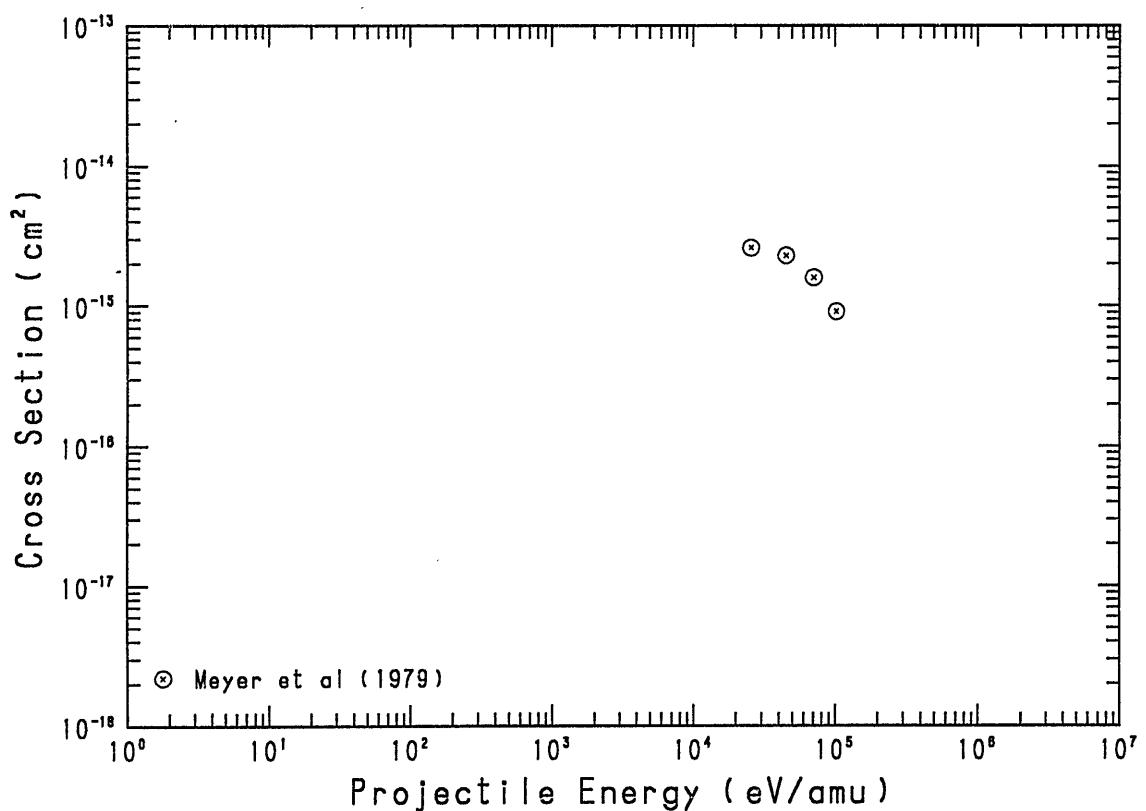


Fig. 215 $Ta^{8+} + H_2 \rightarrow Ta^{7+}$

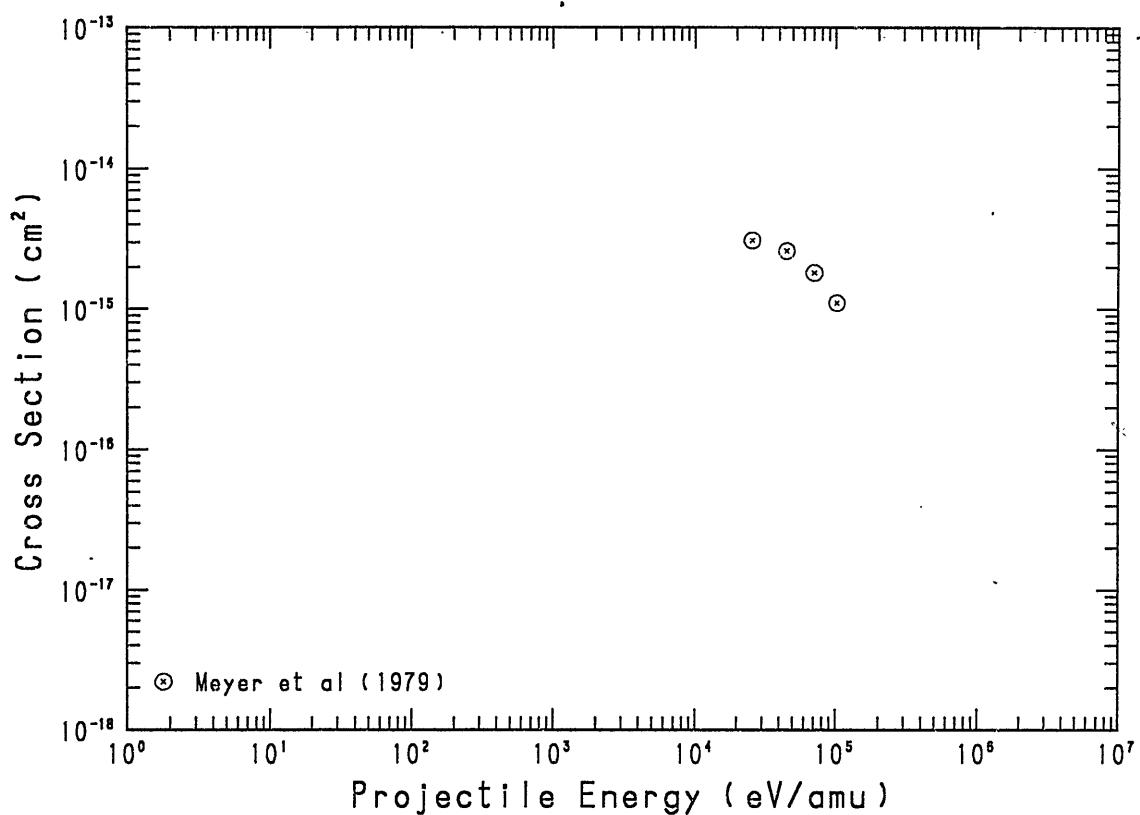


Fig. 216 $Ta^{9+} + H_2 \rightarrow Ta^{8+}$

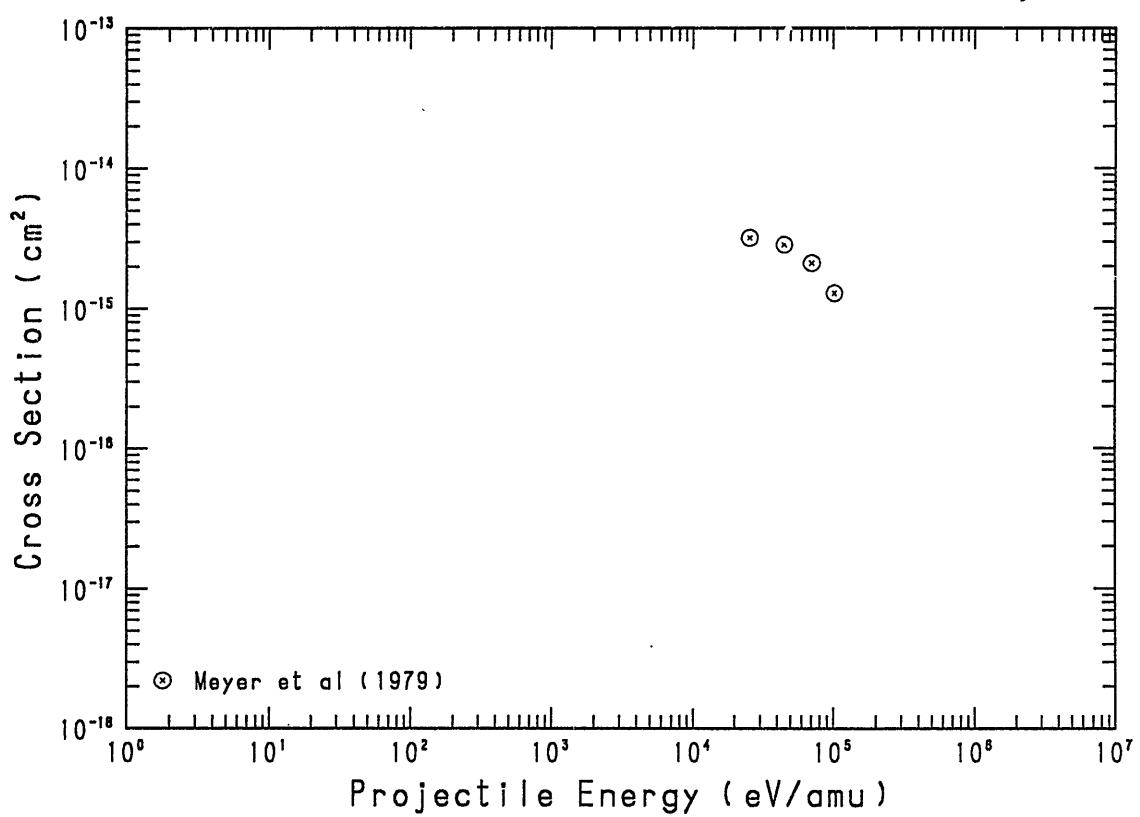


Fig. 217 $Ta^{10+} + H_2 \rightarrow Ta^{9+}$

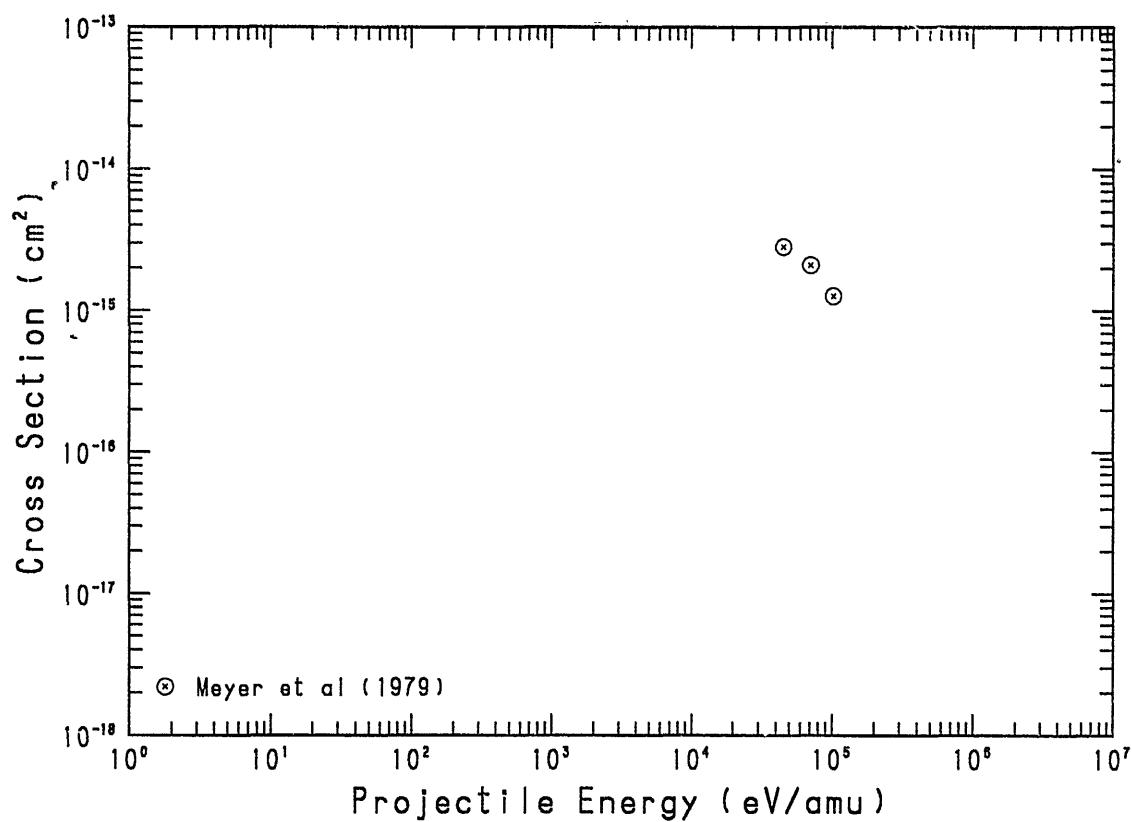


Fig. 218 $Ta^{11+} + H_2 \rightarrow Ta^{10+}$

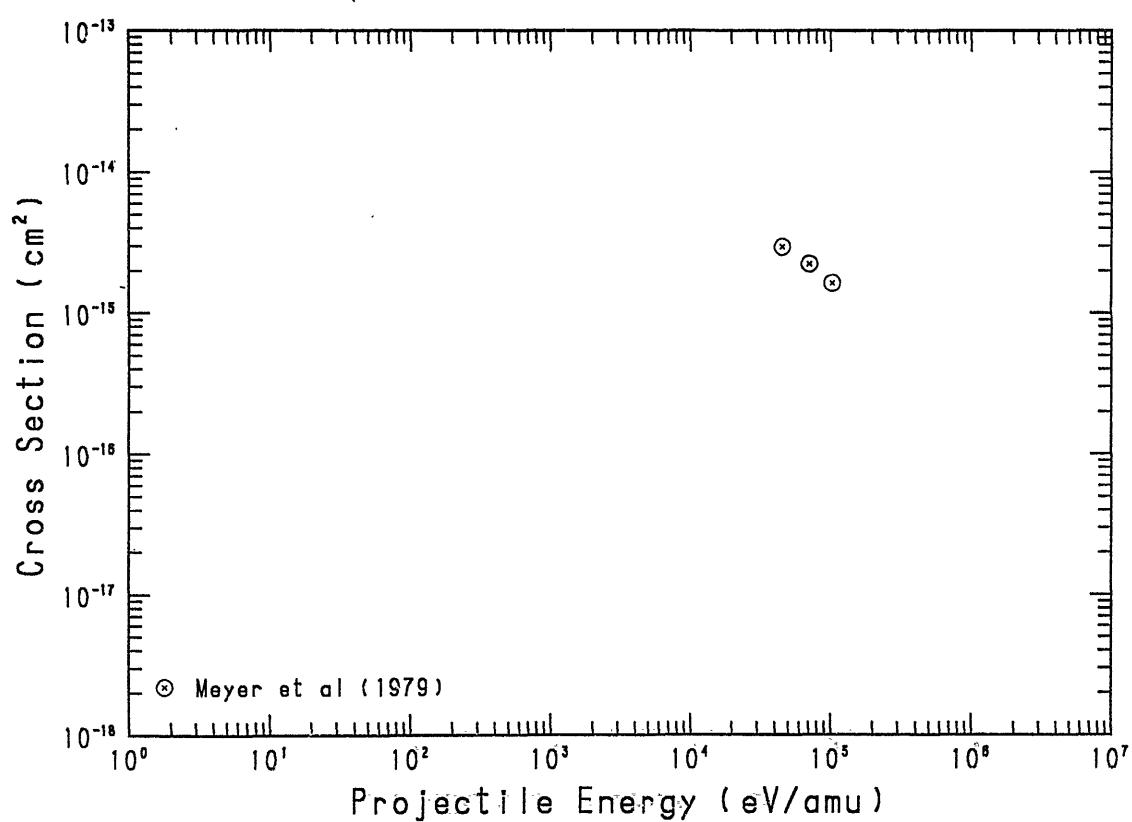


Fig. 219 $Ta^{12+} + H_2 \rightarrow Ta^{11+}$

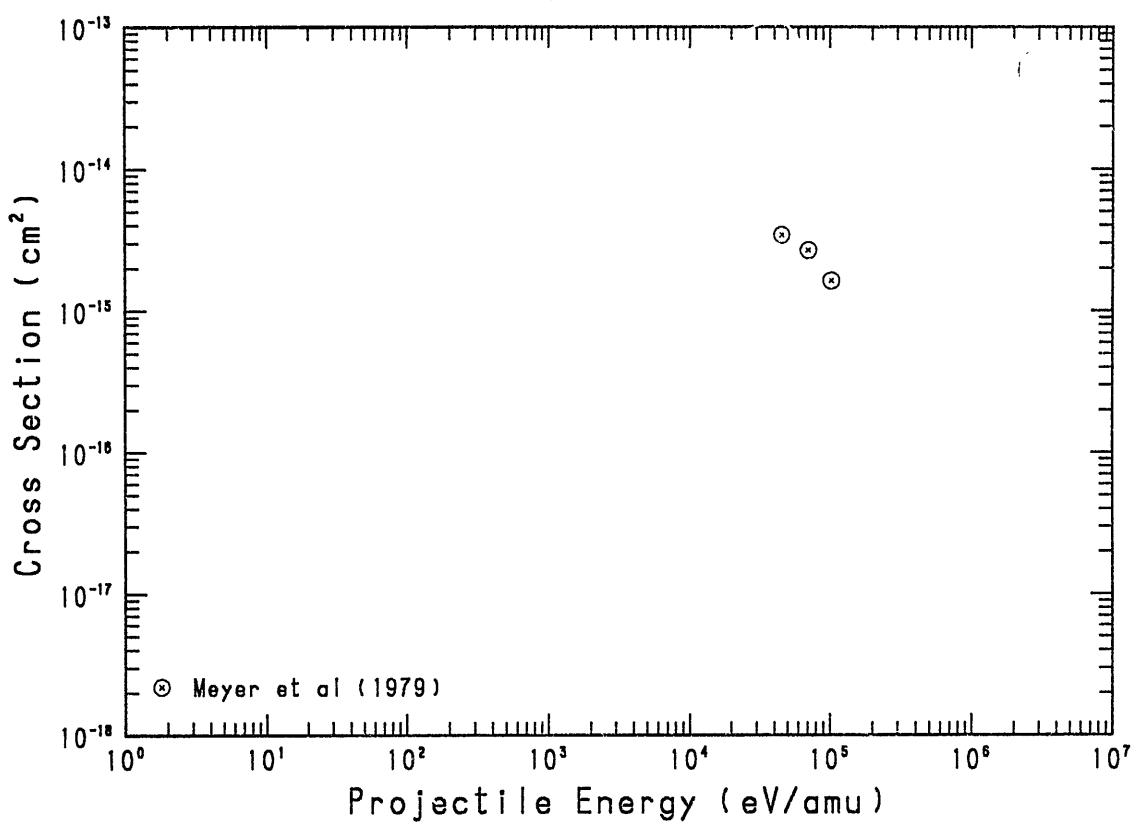


Fig. 220 $Ta^{13+} + H_2 \rightarrow Ta^{12+}$

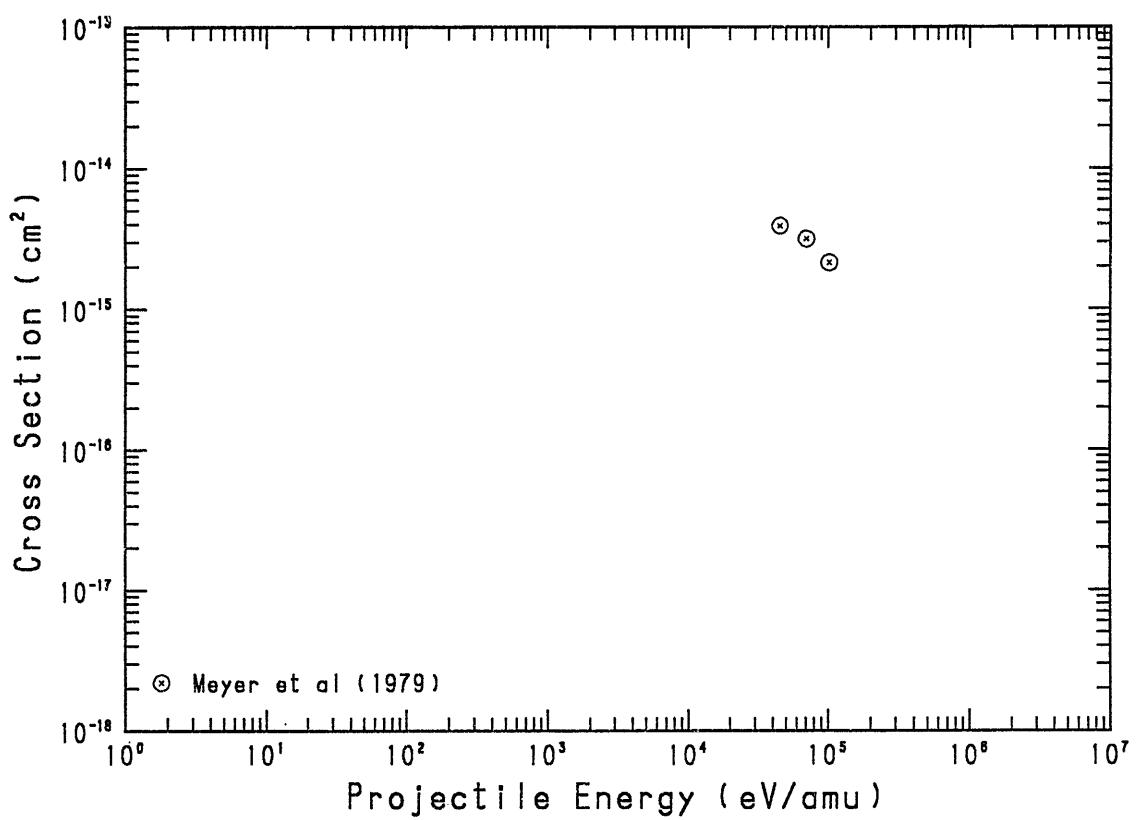


Fig. 221 $Ta^{14+} + H_2 \rightarrow Ta^{13+}$

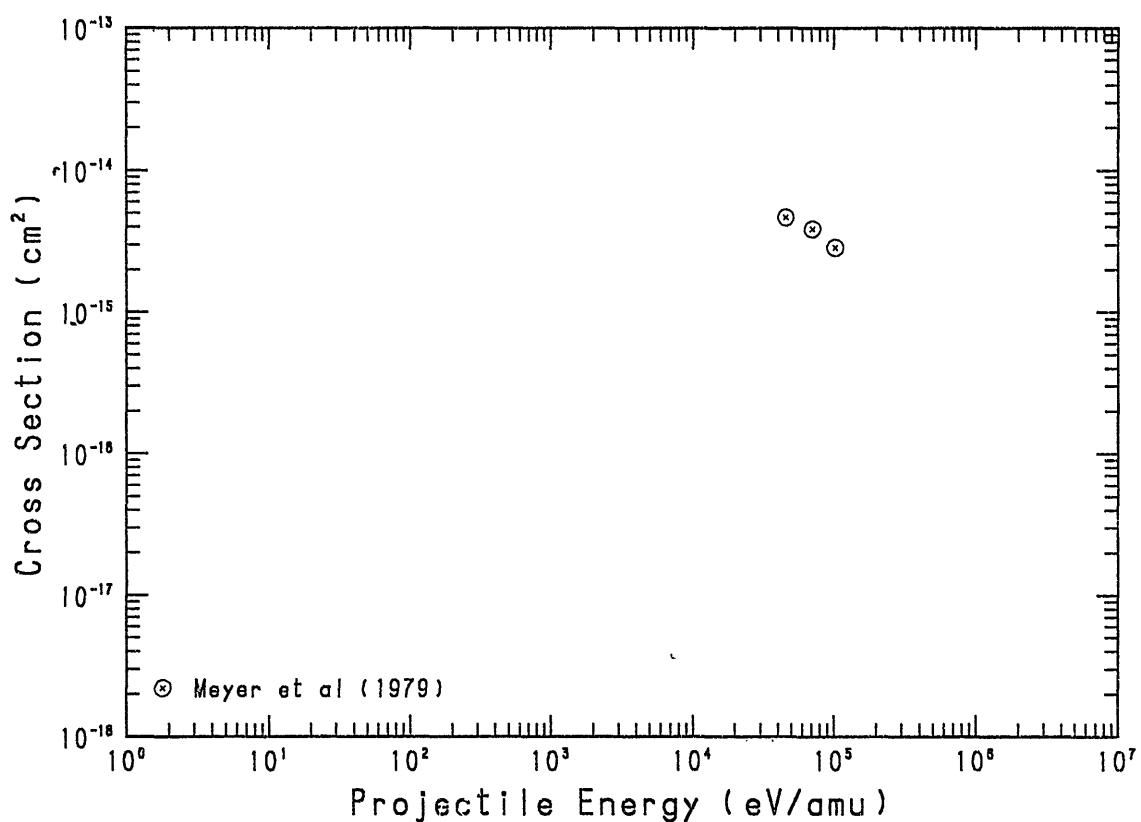


Fig. 222 $Ta^{15+} + H_2 \rightarrow Ta^{14+}$

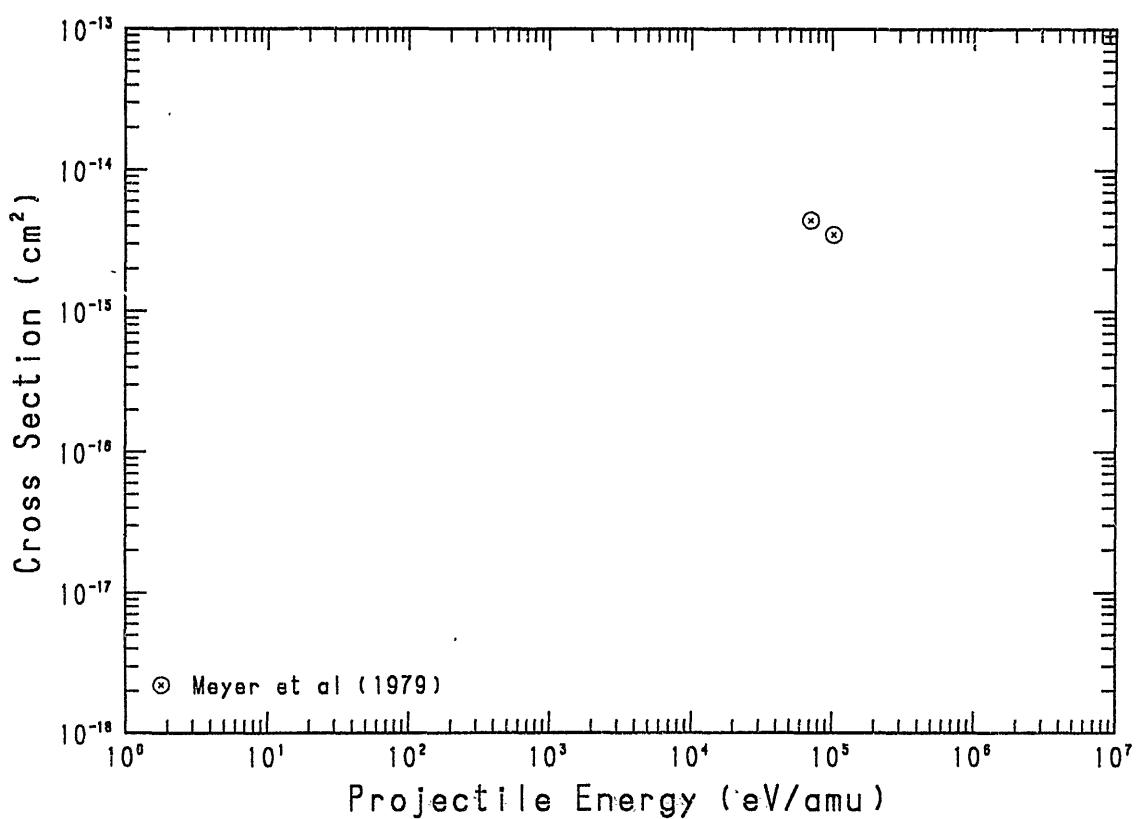


Fig. 223 $Ta^{16+} + H_2 \rightarrow Ta^{15+}$

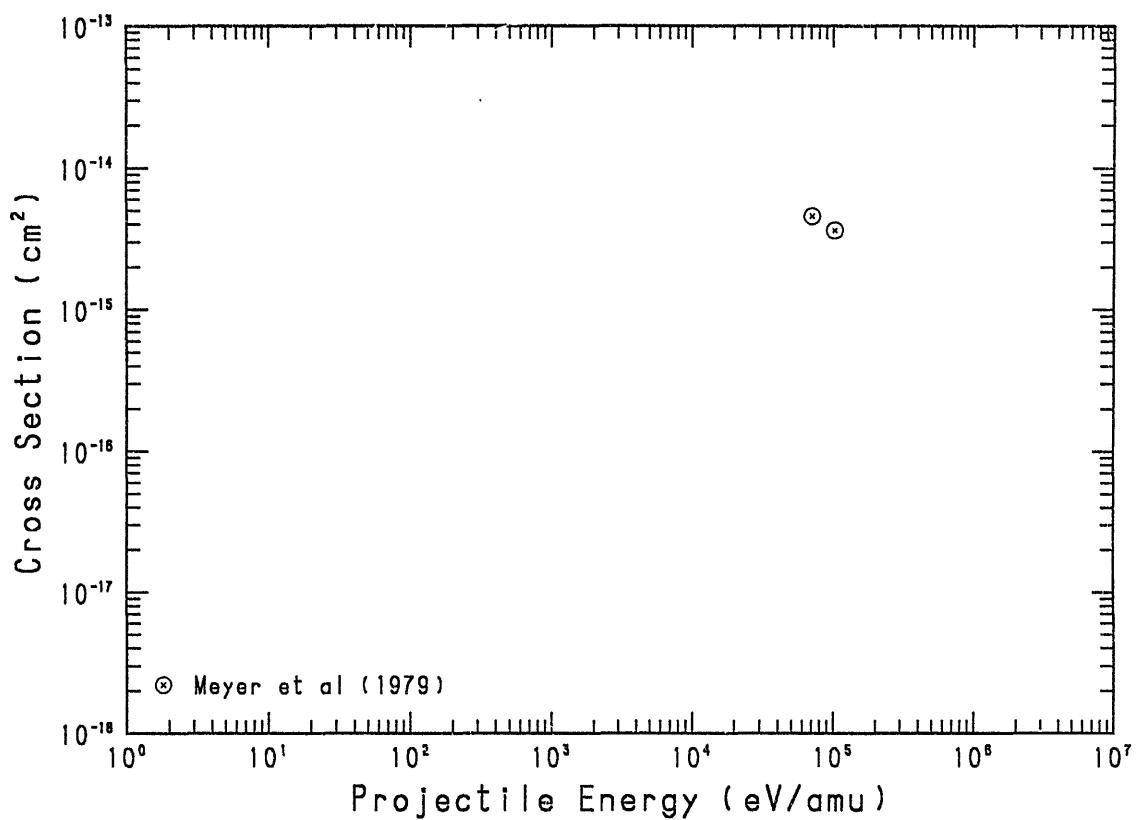


Fig. 224 $Ta^{17+} + H_2 \rightarrow Ta^{16+}$

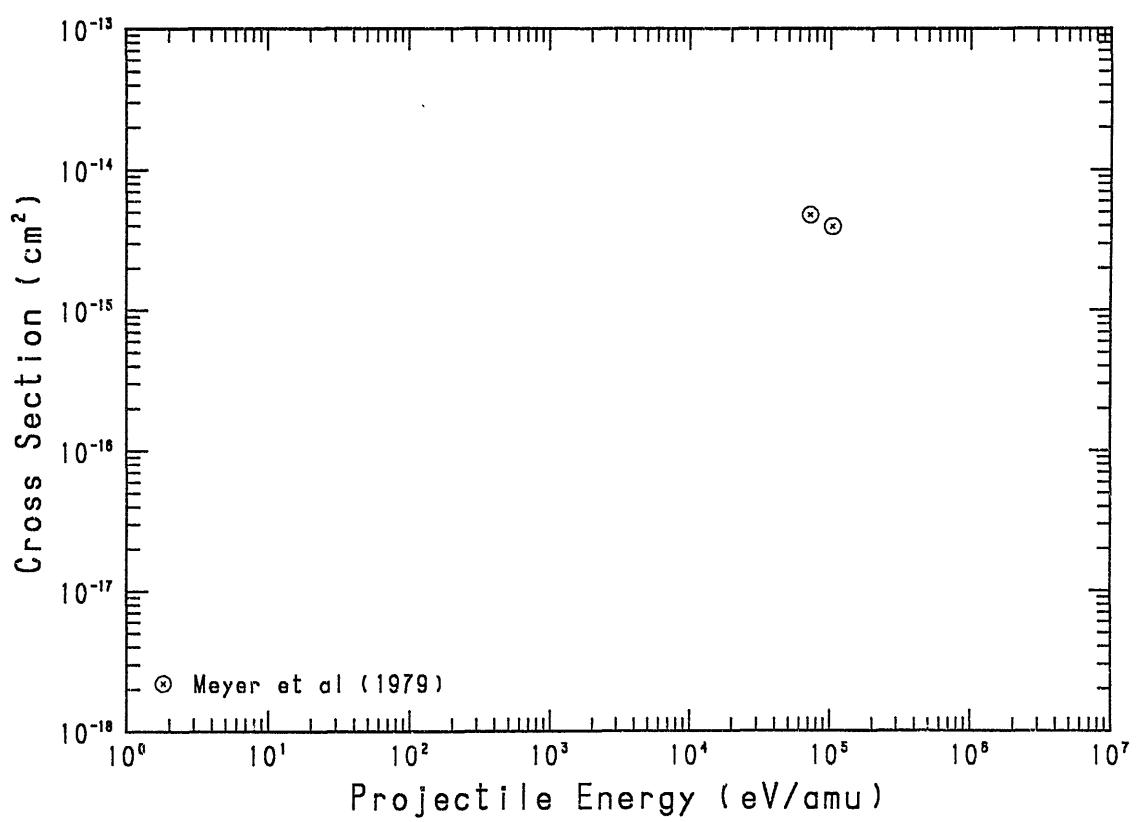


Fig. 225 $Ta^{18+} + H_2 \rightarrow Ta^{17+}$

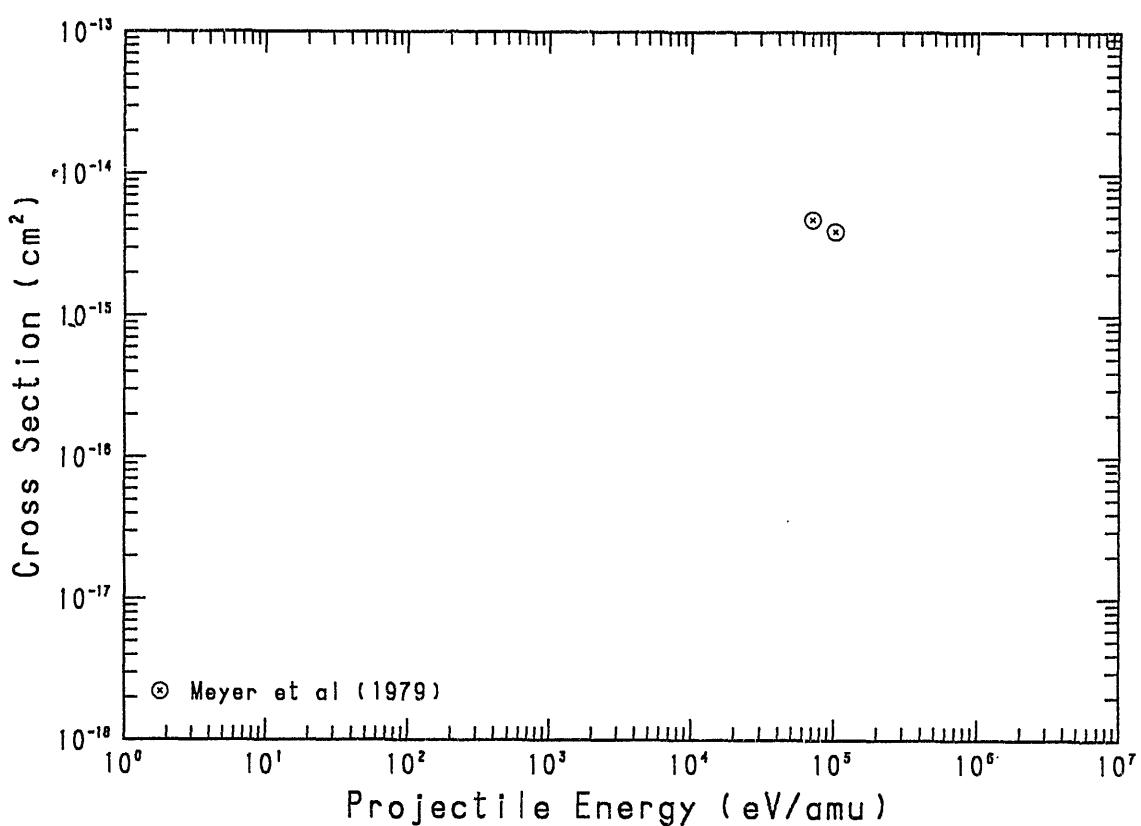


Fig. 226 $Ta^{19+} + H_2 \rightarrow Ta^{18+}$

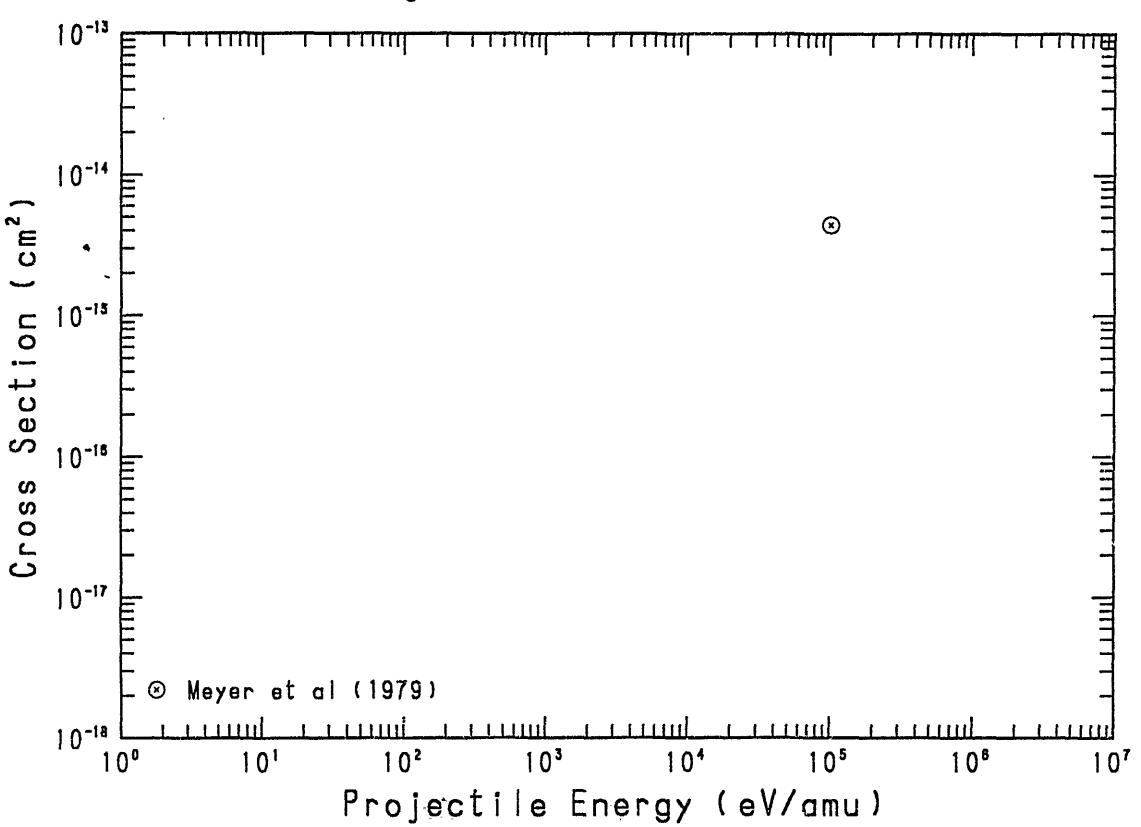


Fig. 227 $W^{4+} + H_2 \rightarrow W^{3+}$

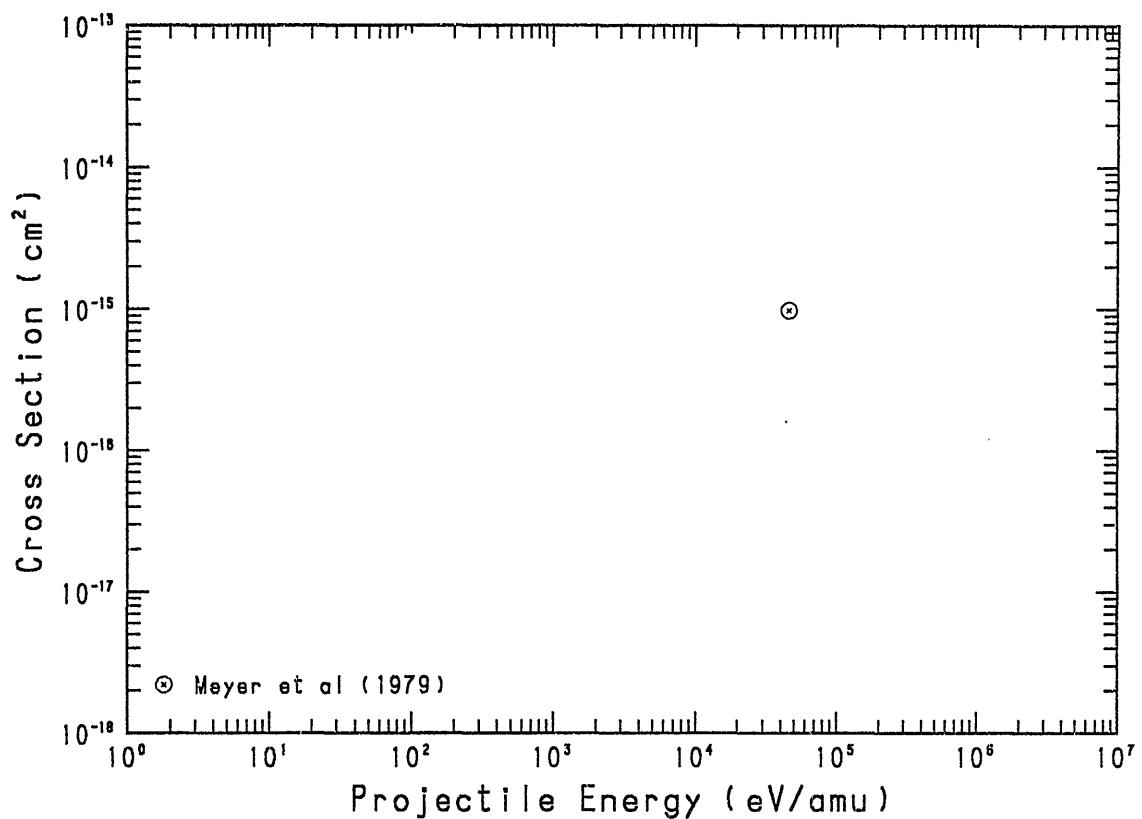


Fig. 228 $W^{5+} + H_2 \rightarrow W^{4+}$

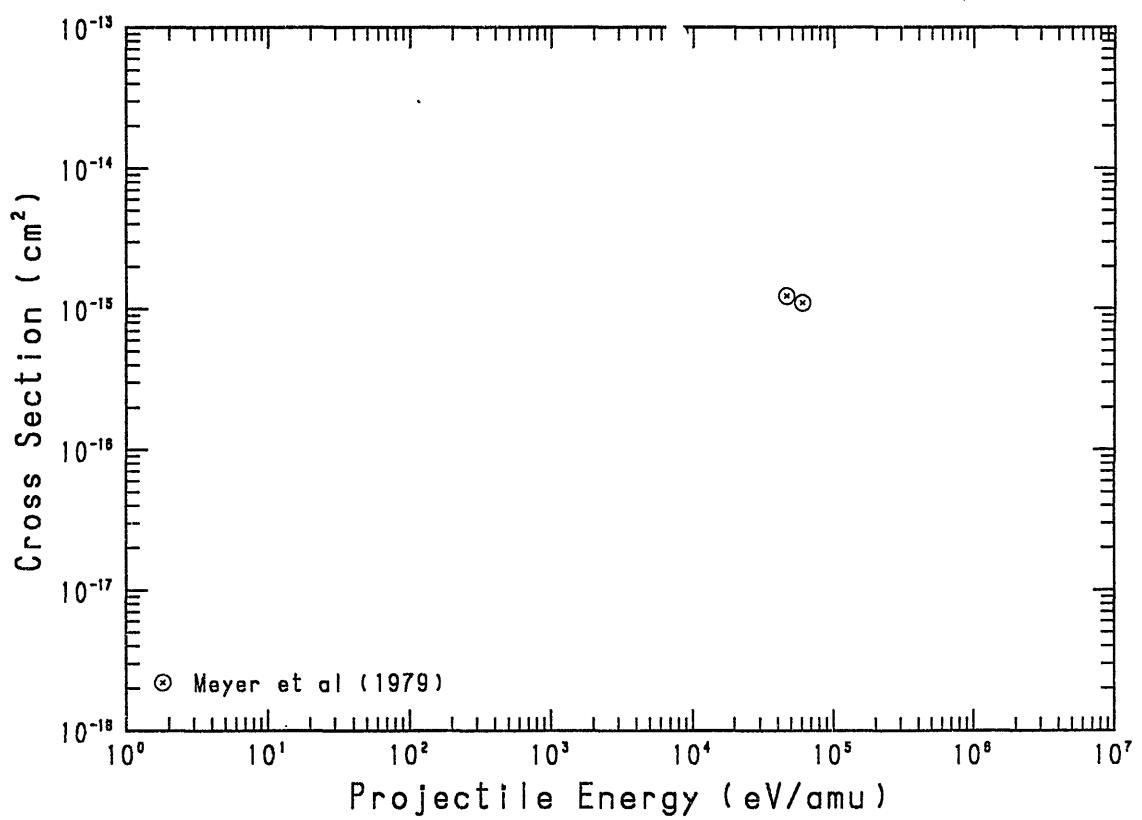


Fig. 229 $W^{6+} + H_2 \rightarrow W^{5+}$

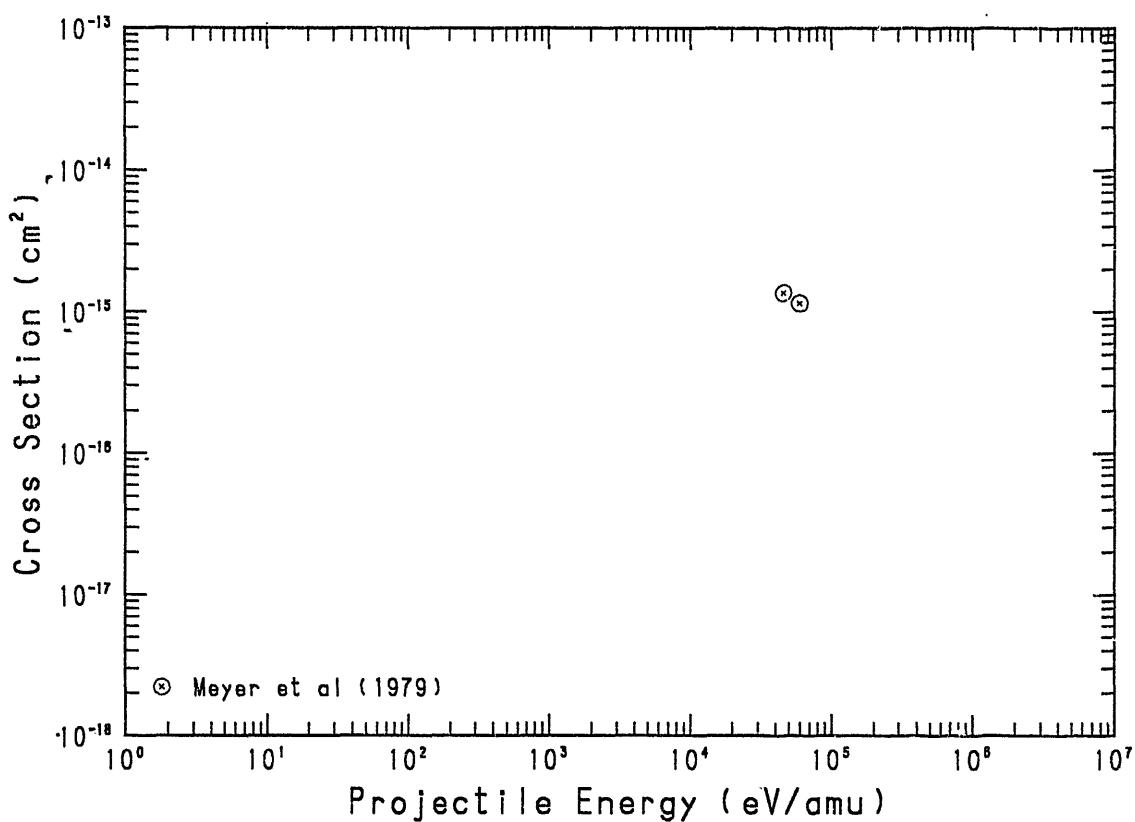


Fig. 230 $W^{7+} + H_2 \rightarrow W^{6+}$

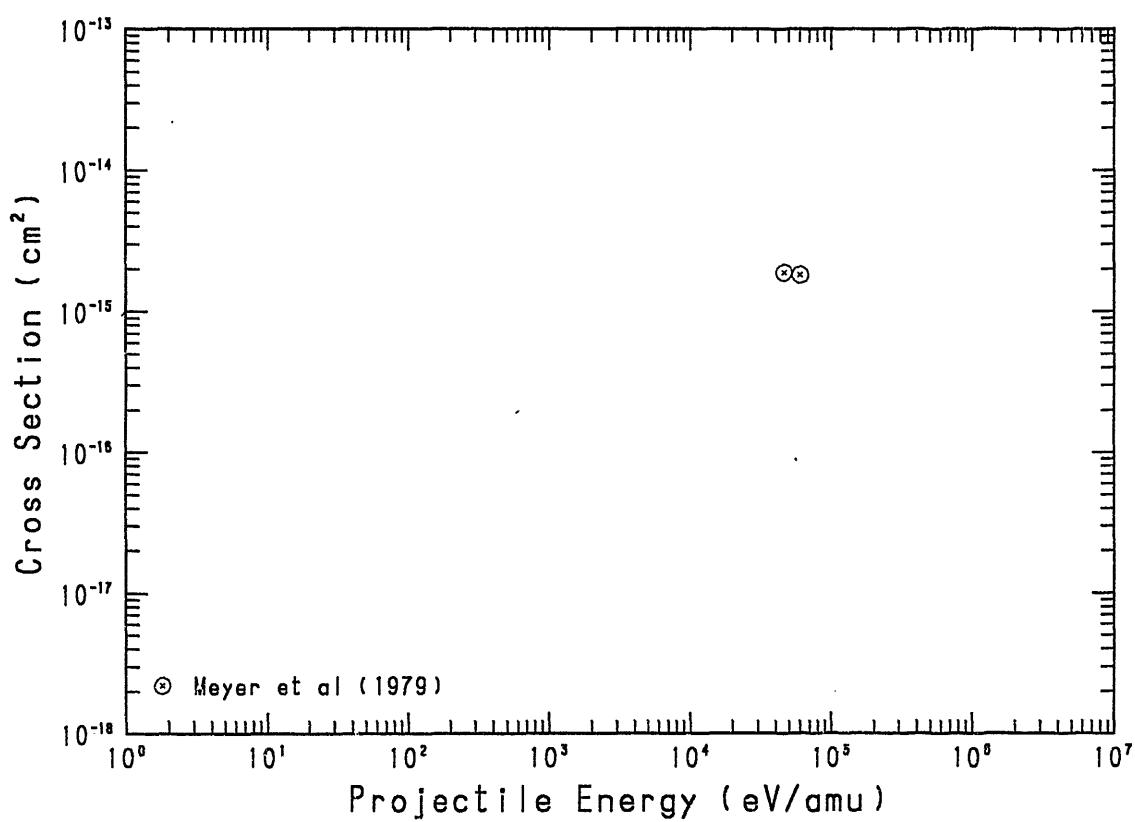


Fig. 231 $W^{8+} + H_2 \rightarrow W^{7+}$

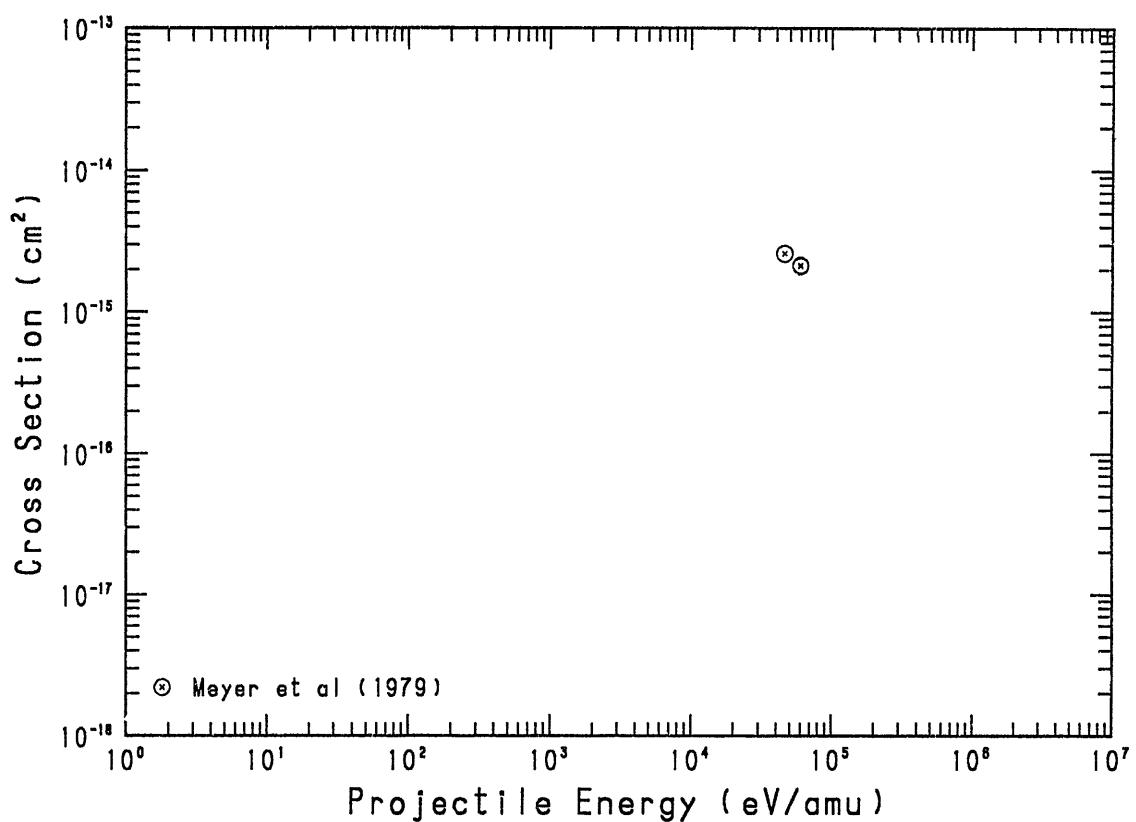


Fig. 232 $W^{9+} + H_2 \rightarrow W^{8+}$

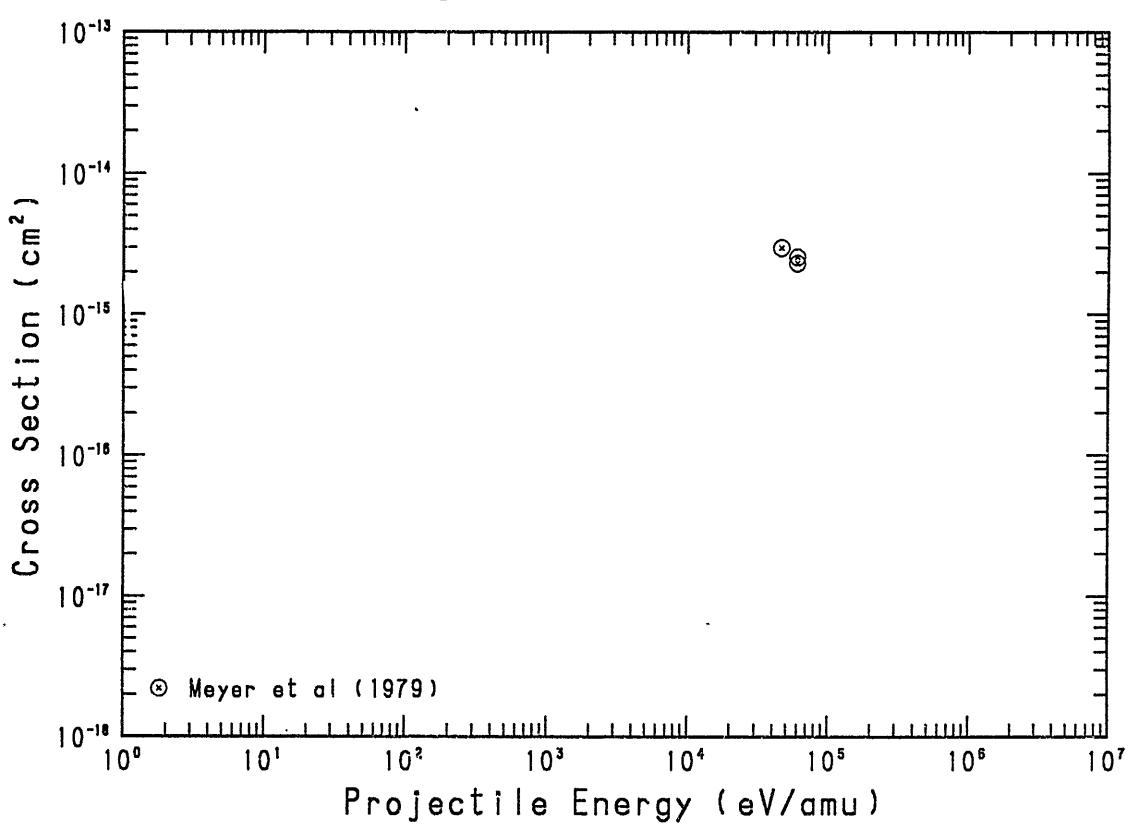


Fig. 233 $W^{10+} + H_2 \rightarrow W^{9+}$

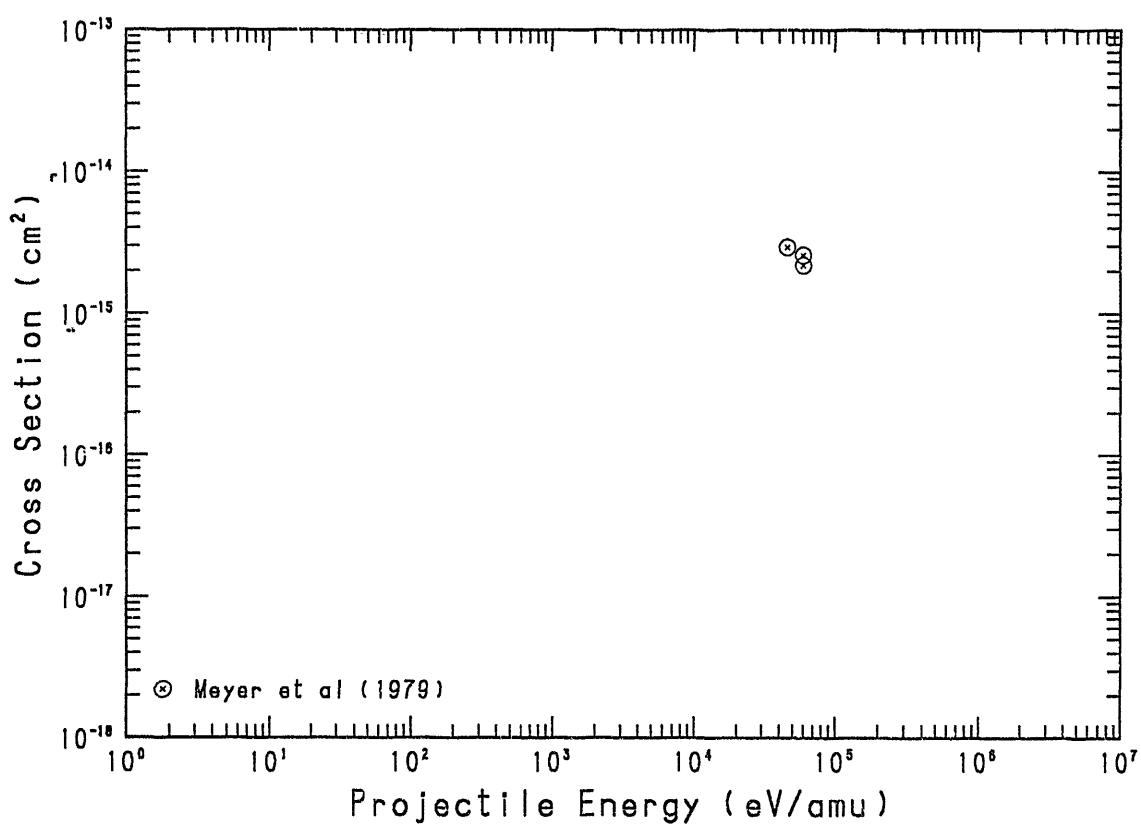


Fig. 234 $W^{11+} + H_2 \rightarrow W^{10+}$

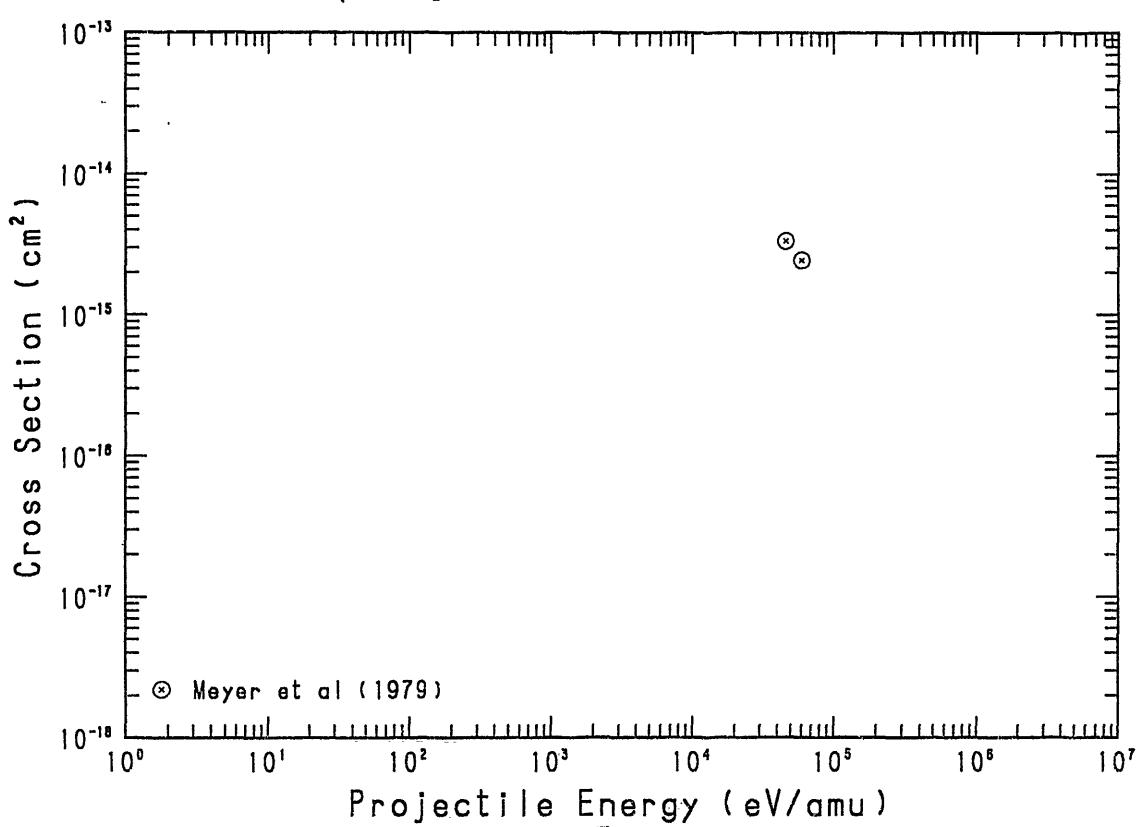


Fig. 235 $W^{12+} + H_2 \rightarrow W^{11+}$

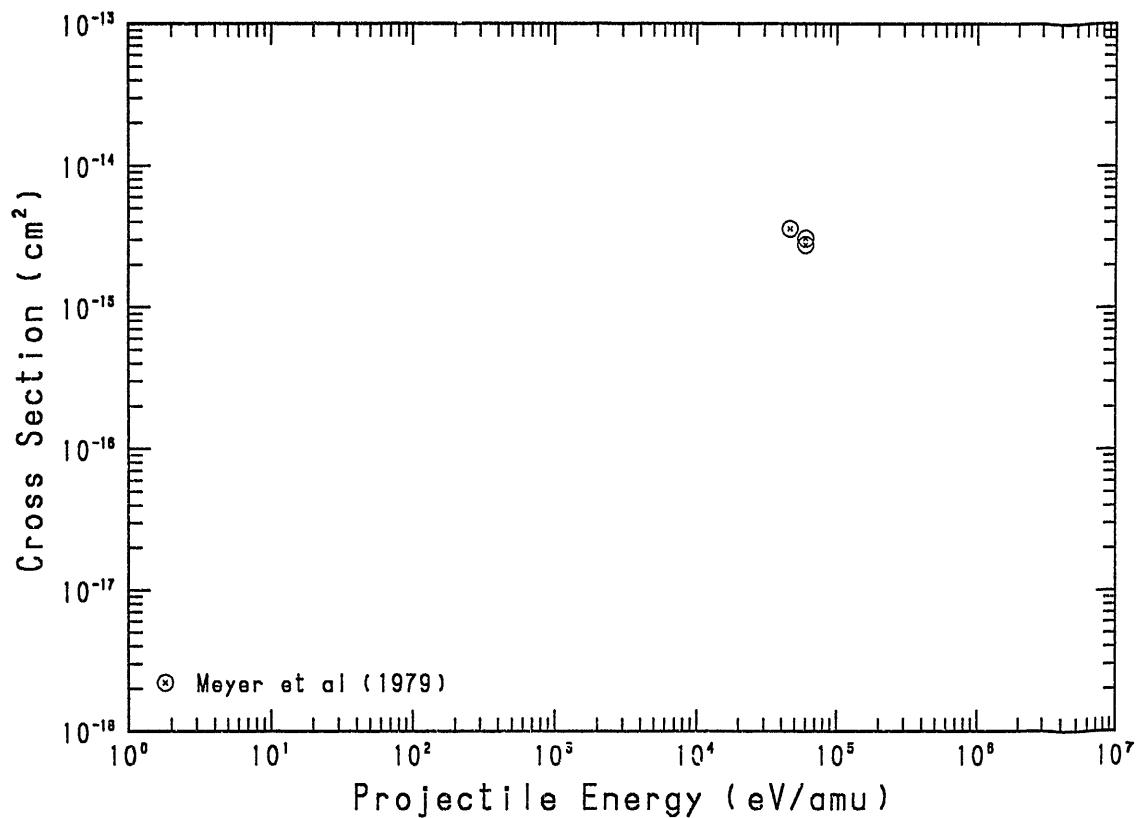


Fig. 236 $W^{13+} + H_2 \rightarrow W^{12+}$

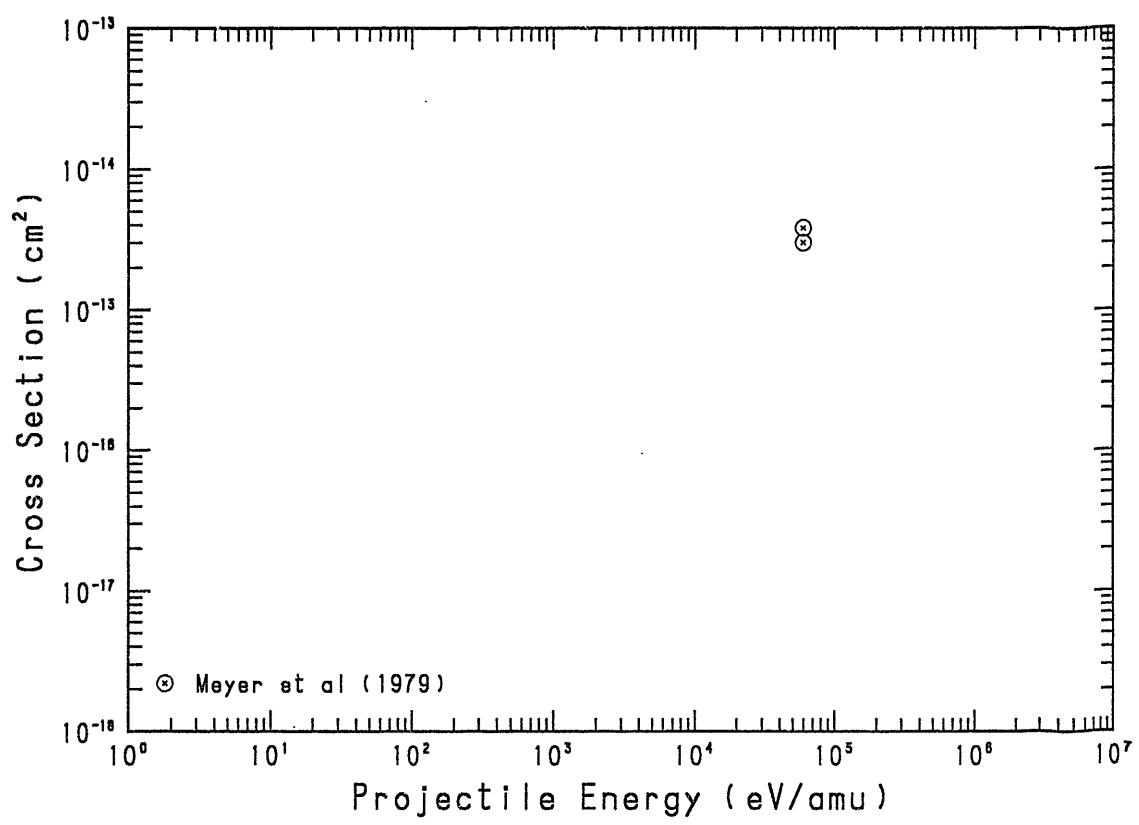


Fig. 237 $W^{14+} + H_2 \rightarrow W^{13+}$

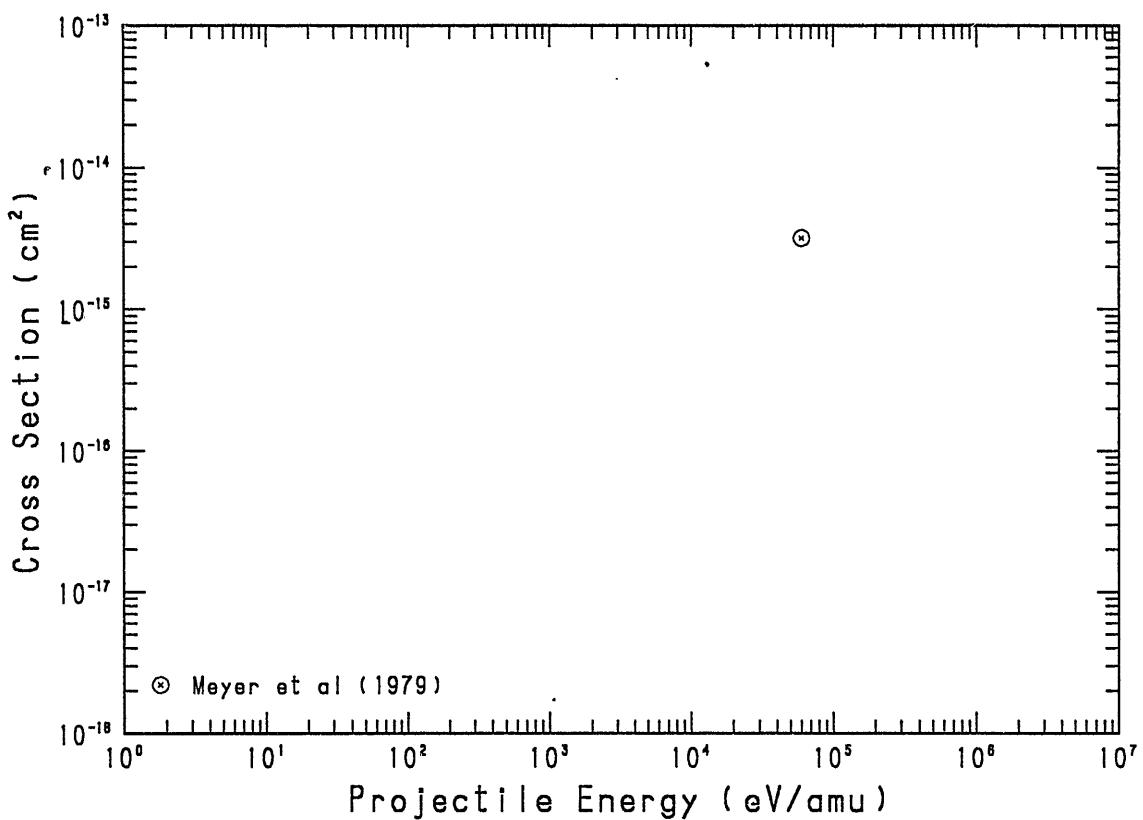


Fig. 238 $W^{15+} + H_2 \rightarrow W^{14+}$

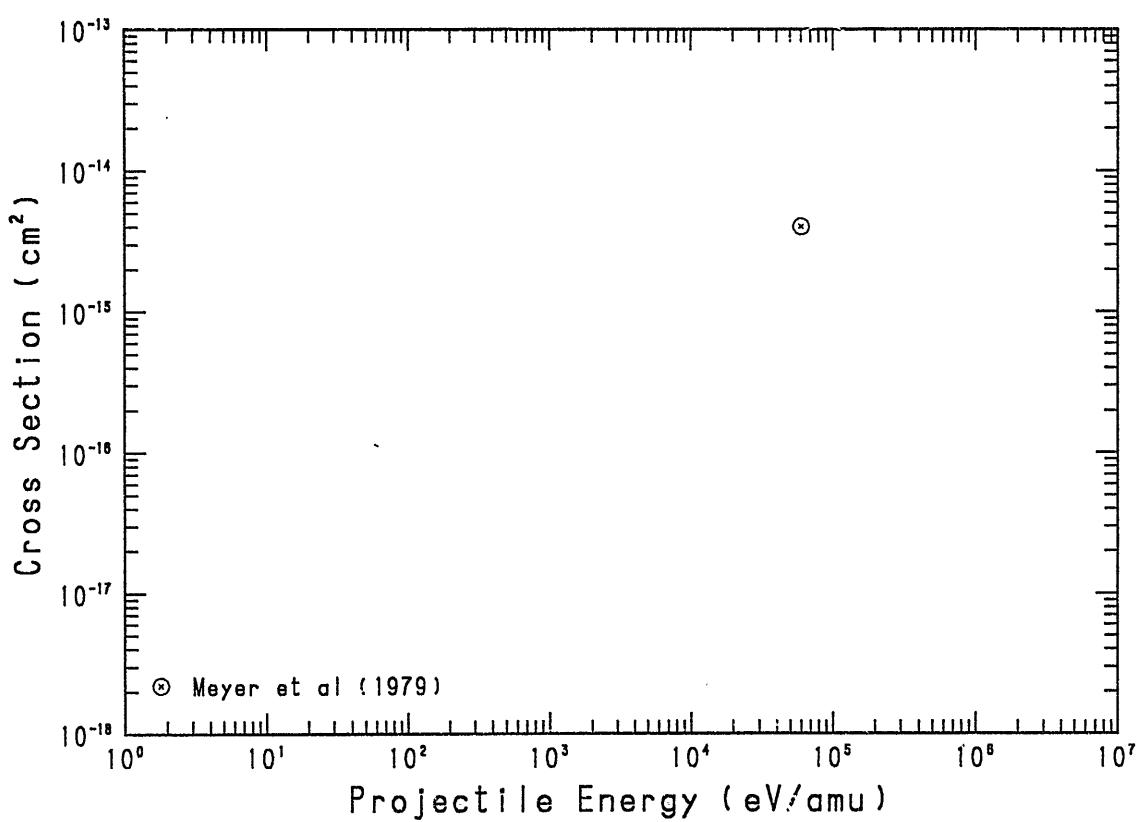


Fig. 239 $\text{Au}^{5+} + \text{H}_2 \rightarrow \text{Au}^{4+}$

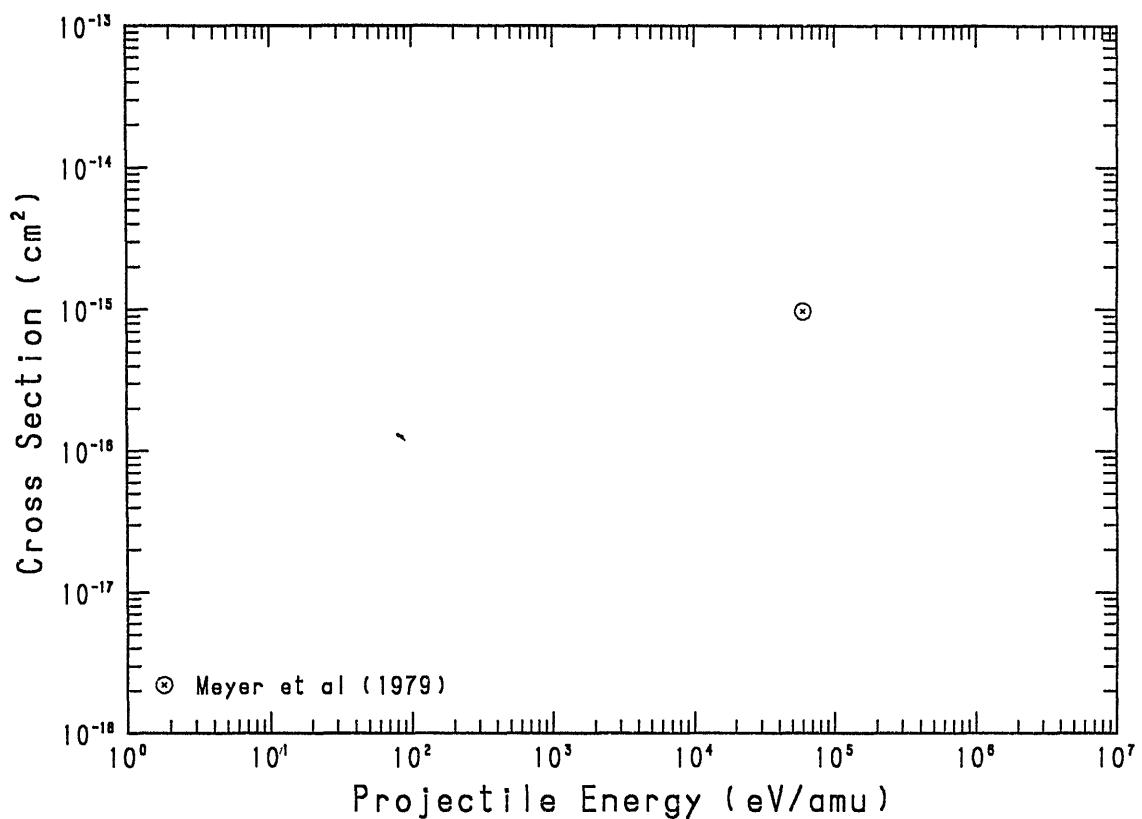


Fig. 240 $\text{Au}^{6+} + \text{H}_2 \rightarrow \text{Au}^{5+}$

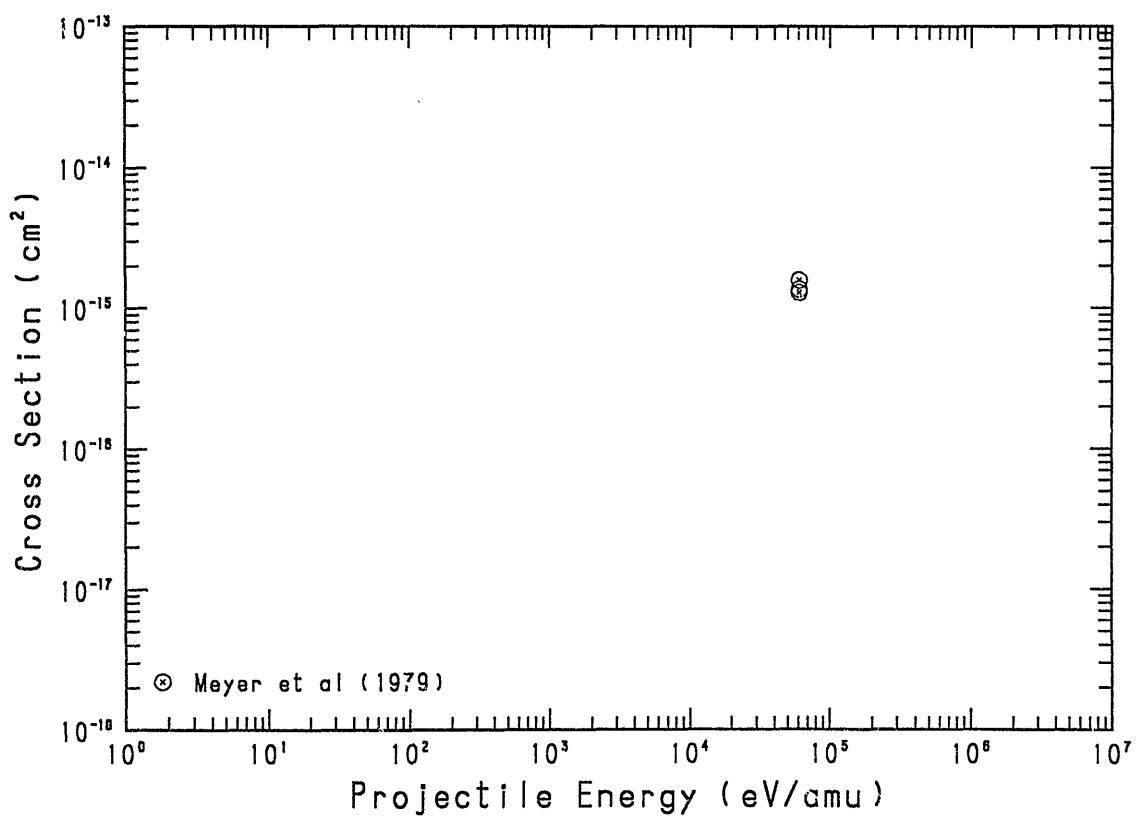


Fig. 241 $\text{Au}^{7+} + \text{H}_2 \rightarrow \text{Au}^{6+}$

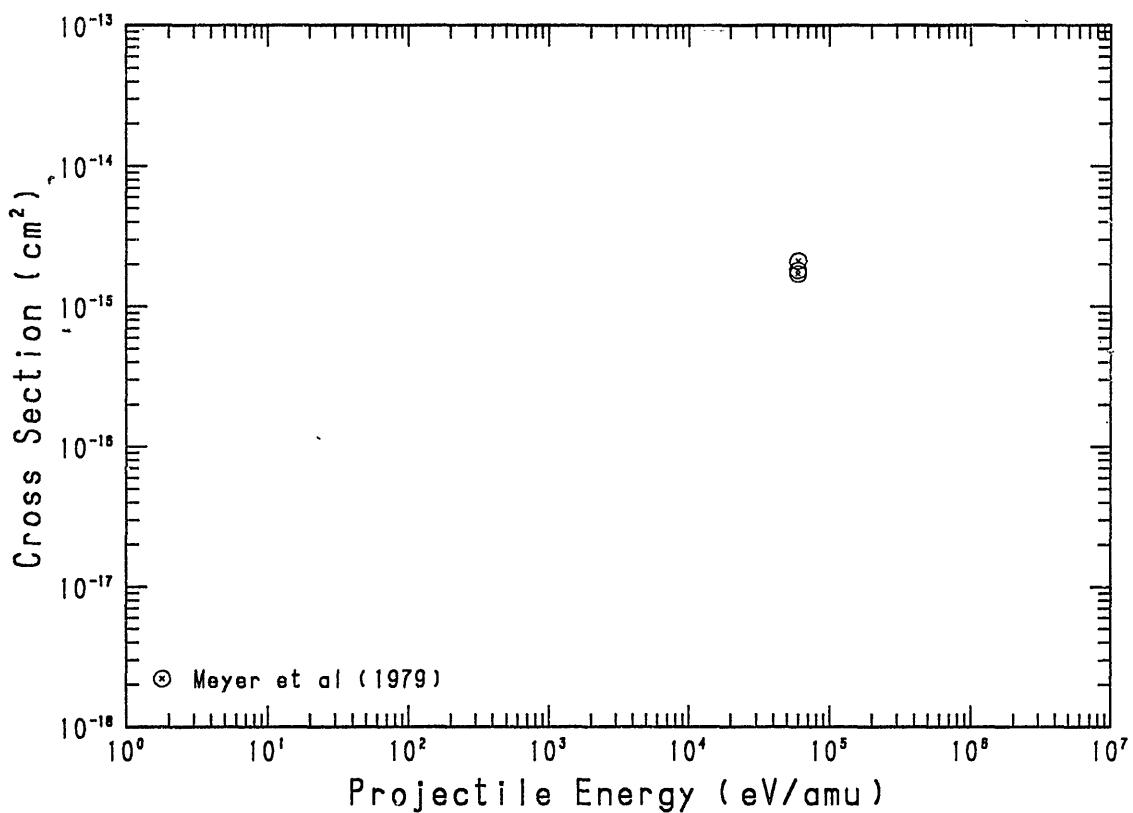


Fig. 242 $\text{Au}^{8+} + \text{H}_2 \rightarrow \text{Au}^{7+}$

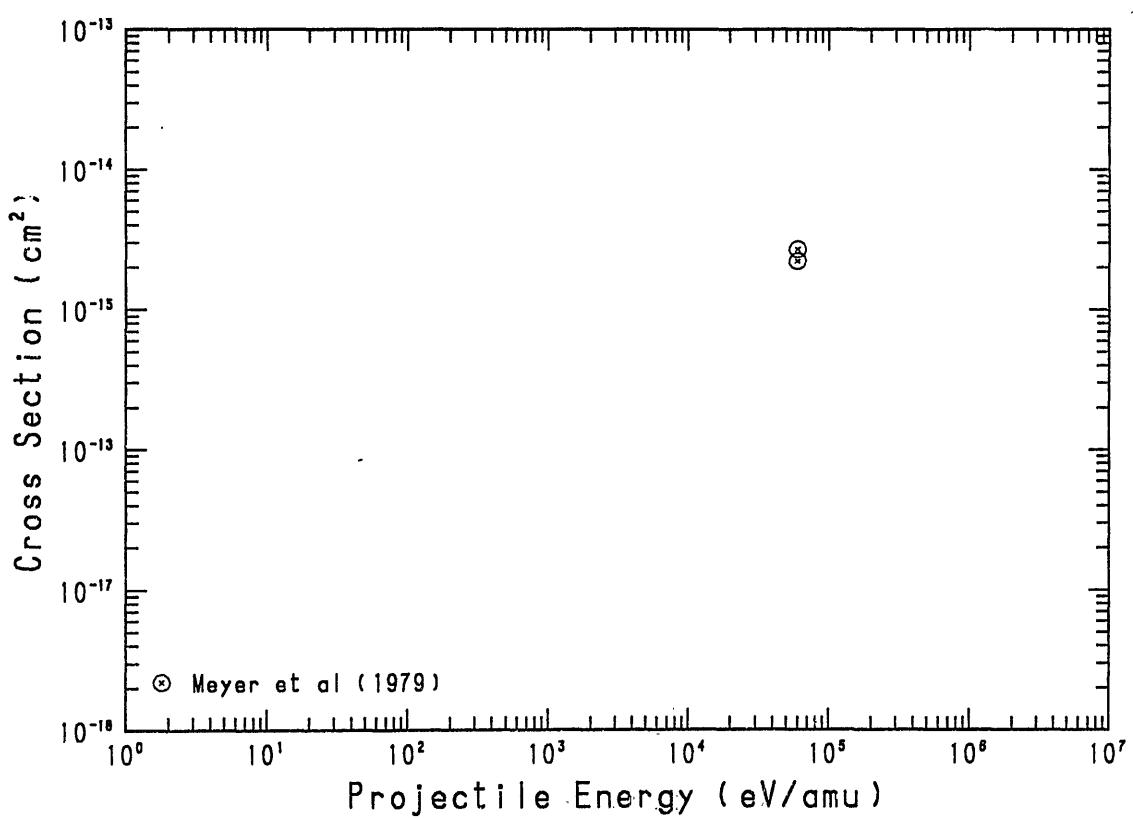


Fig. 243 $\text{Au}^{9+} + \text{H}_2 \rightarrow \text{Au}^{8+}$

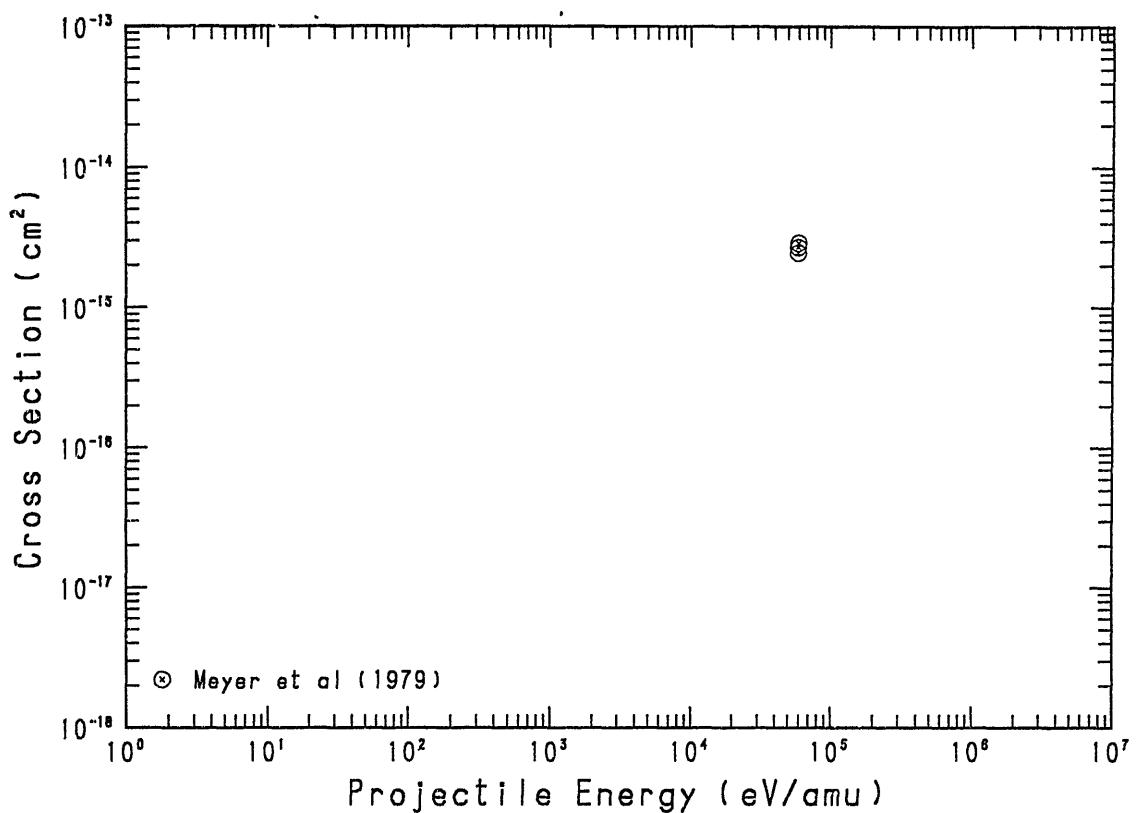


Fig. 244 $\text{Au}^{10+} + \text{H}_2 \rightarrow \text{Au}^{9+}$

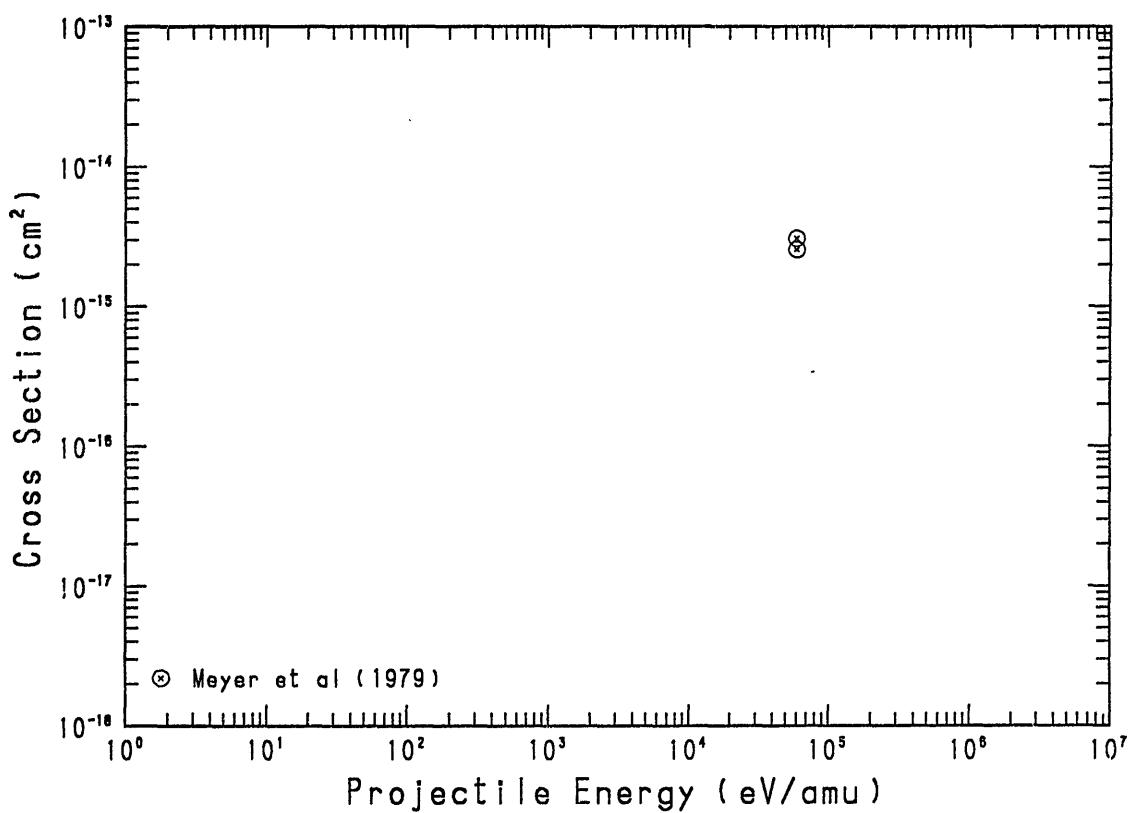


Fig. 245 $\text{Au}^{11+} + \text{H}_2 \rightarrow \text{Au}^{10+}$

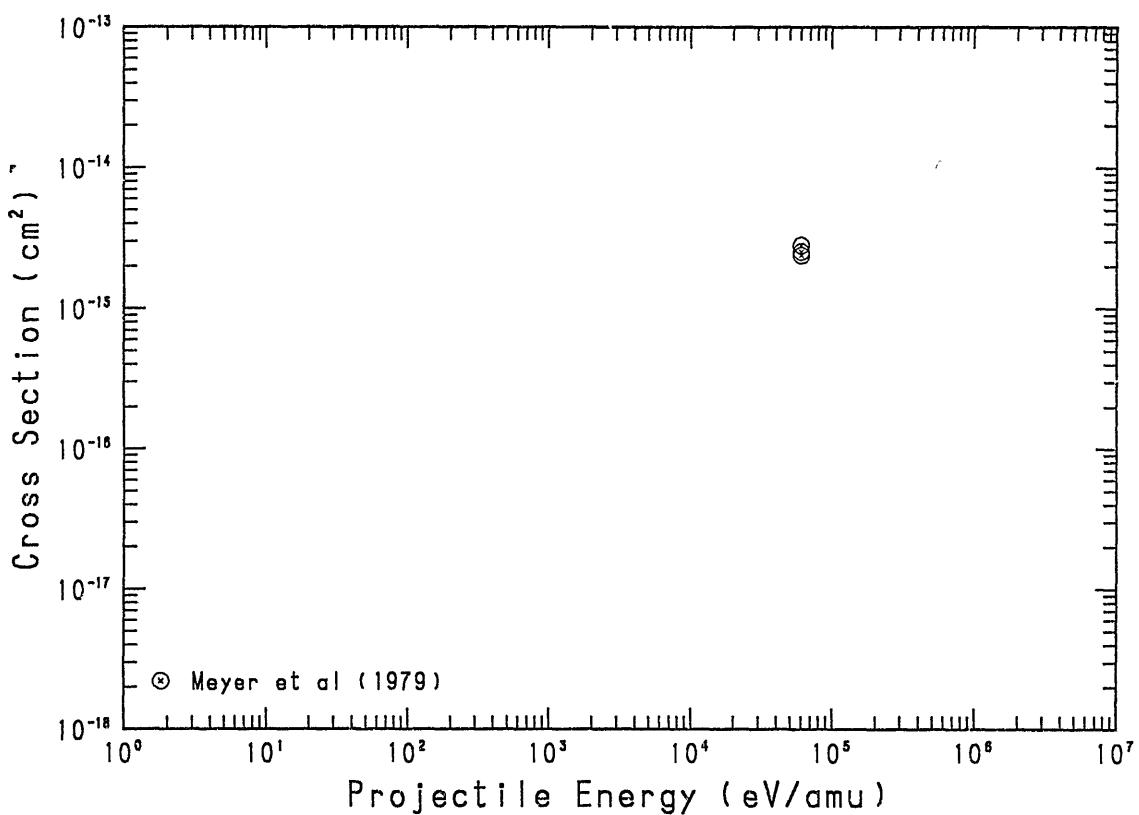


Fig. 246 $\text{Au}^{12+} + \text{H}_2 \rightarrow \text{Au}^{11+}$

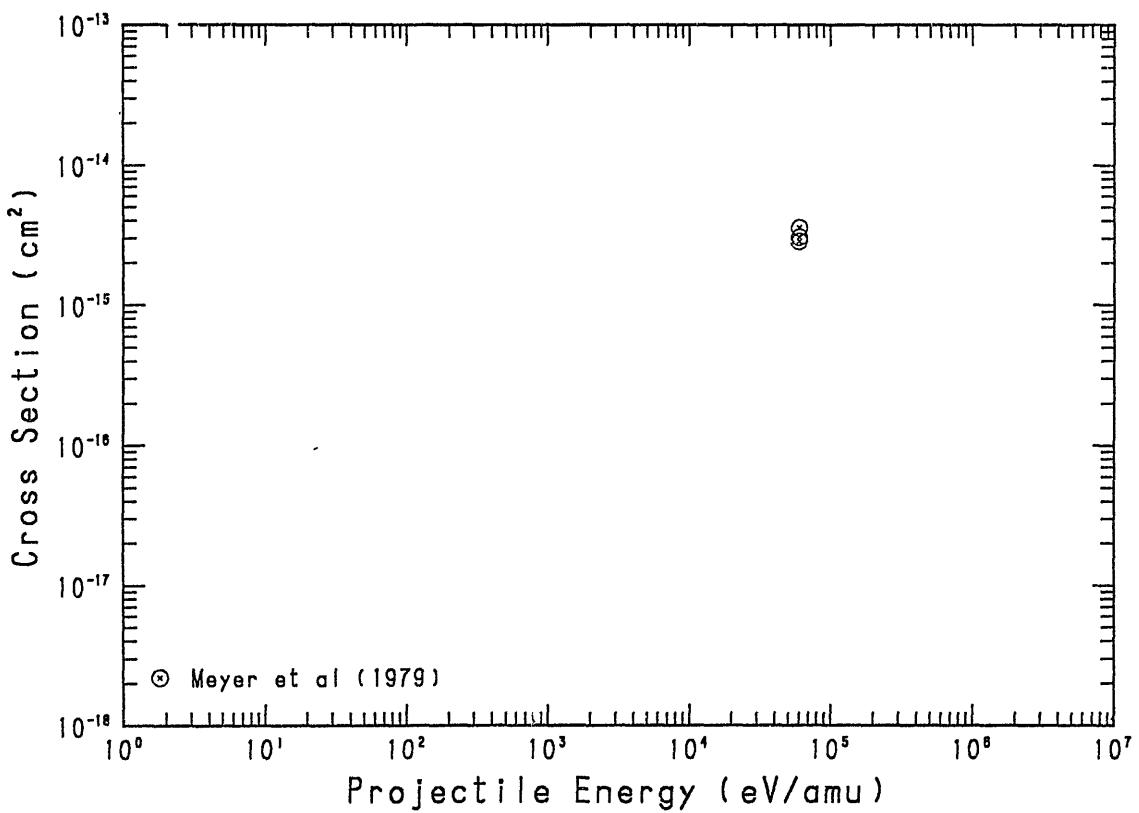


Fig. 247 $\text{Au}^{13+} + \text{H}_2 \rightarrow \text{Au}^{12+}$

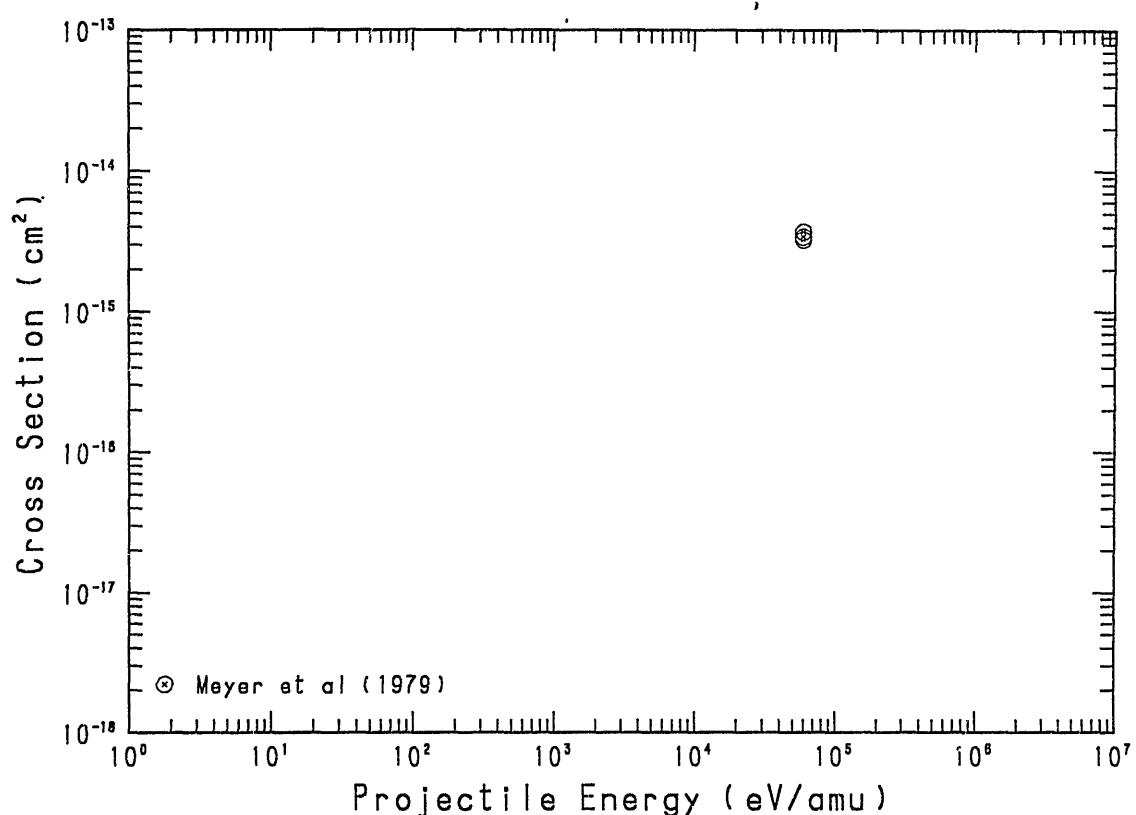


Fig. 248 $\text{Au}^{14+} + \text{H}_2 \rightarrow \text{Au}^{13+}$

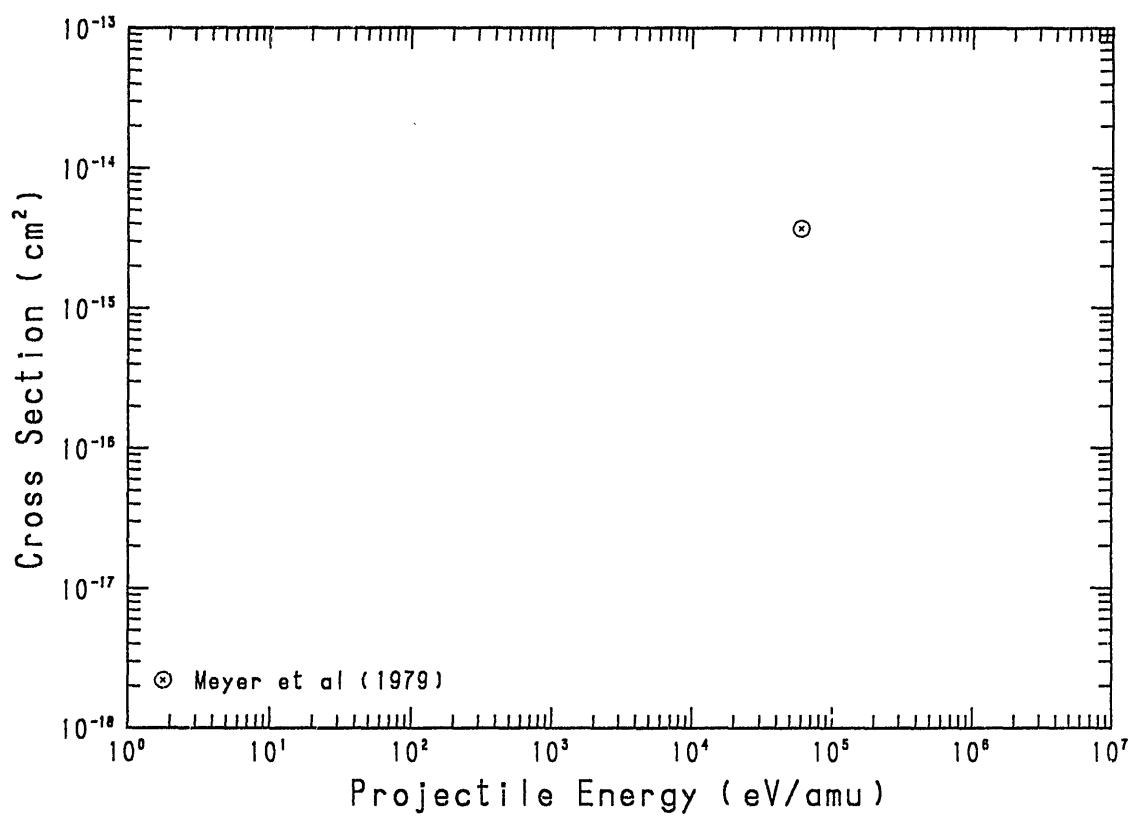


Fig. 249 $\text{Au}^{15+} + \text{H}_2 \rightarrow \text{Au}^{14+}$

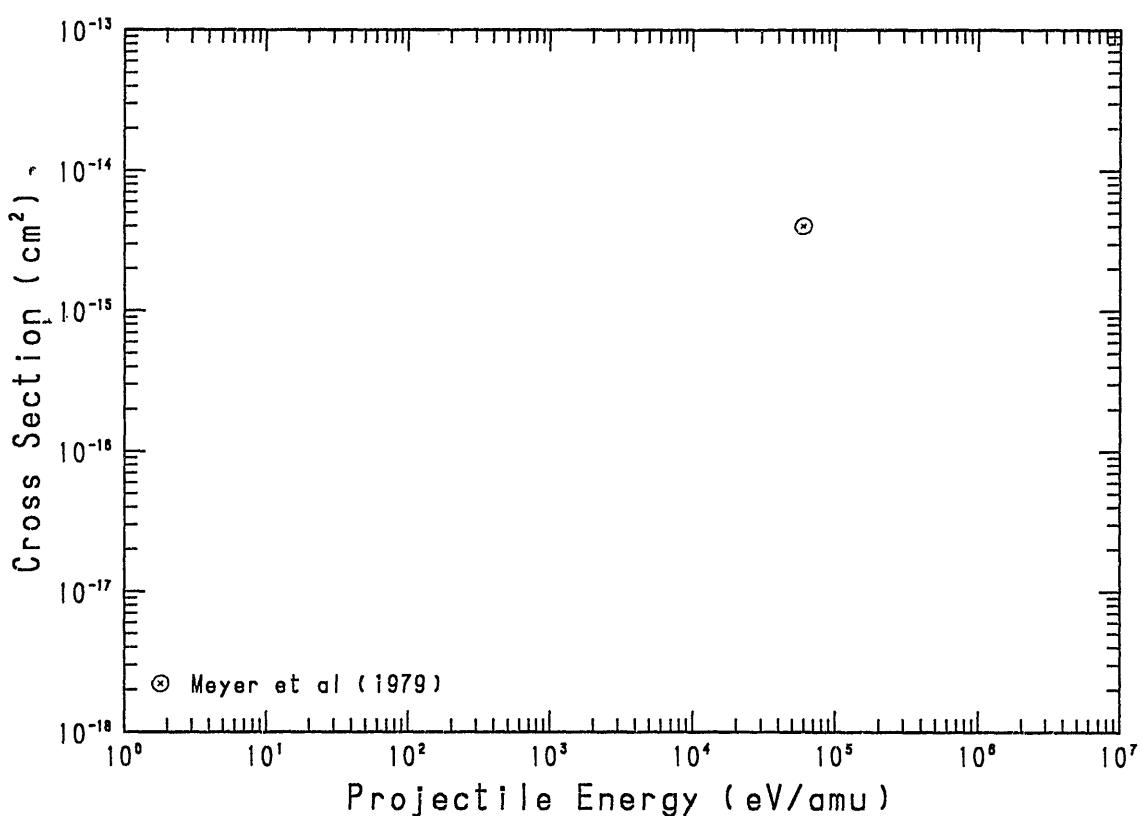


Fig. 250 $\text{Au}^{18+} + \text{H}_2 \rightarrow \text{Au}^{15+}$

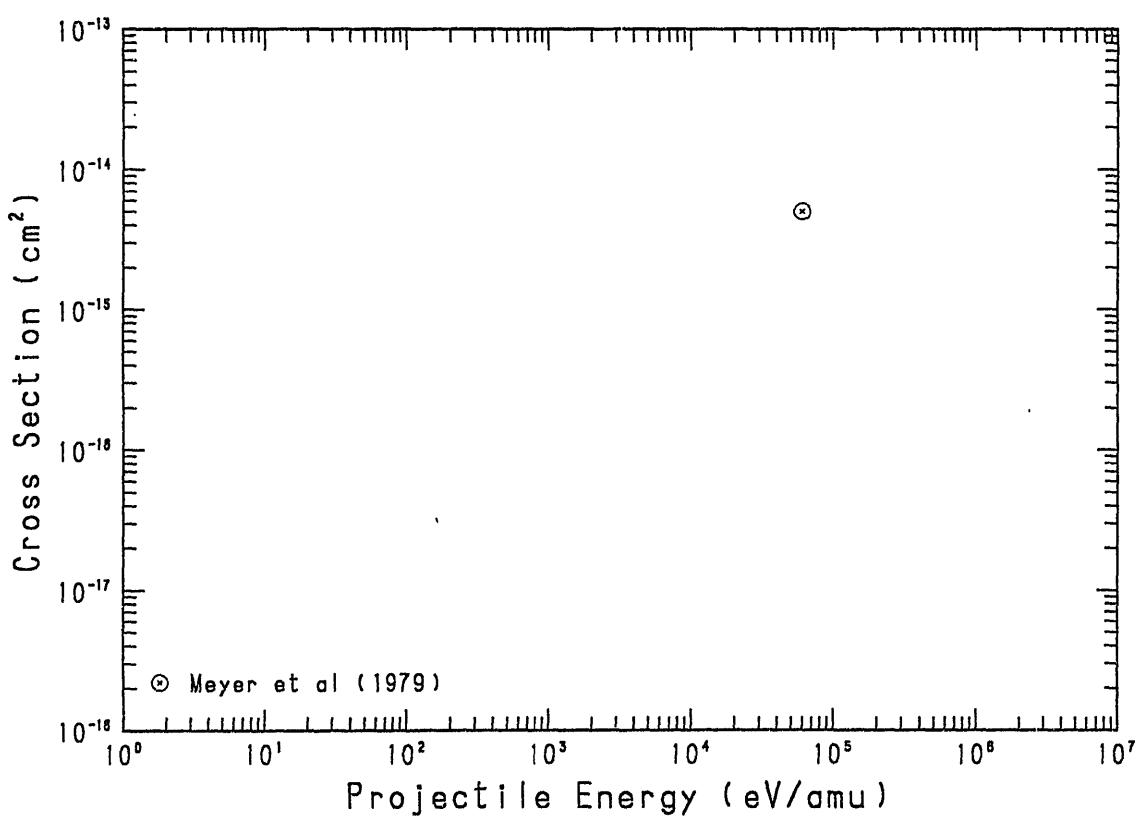


Fig. 251 $\text{Pb}^{2+} + \text{H}_2 \rightarrow \text{Pb}^+$

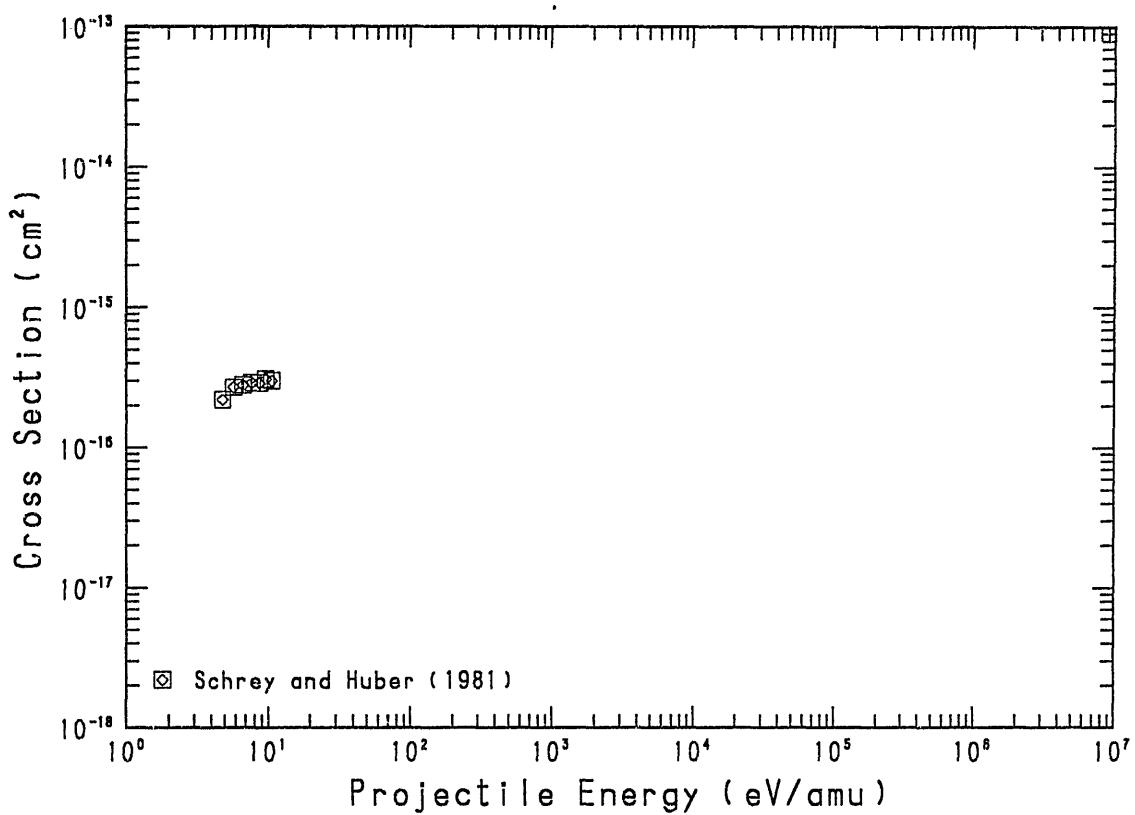


Fig. 252 $\text{Pb}^{3+} + \text{H}_2 \rightarrow \text{Pb}^+$

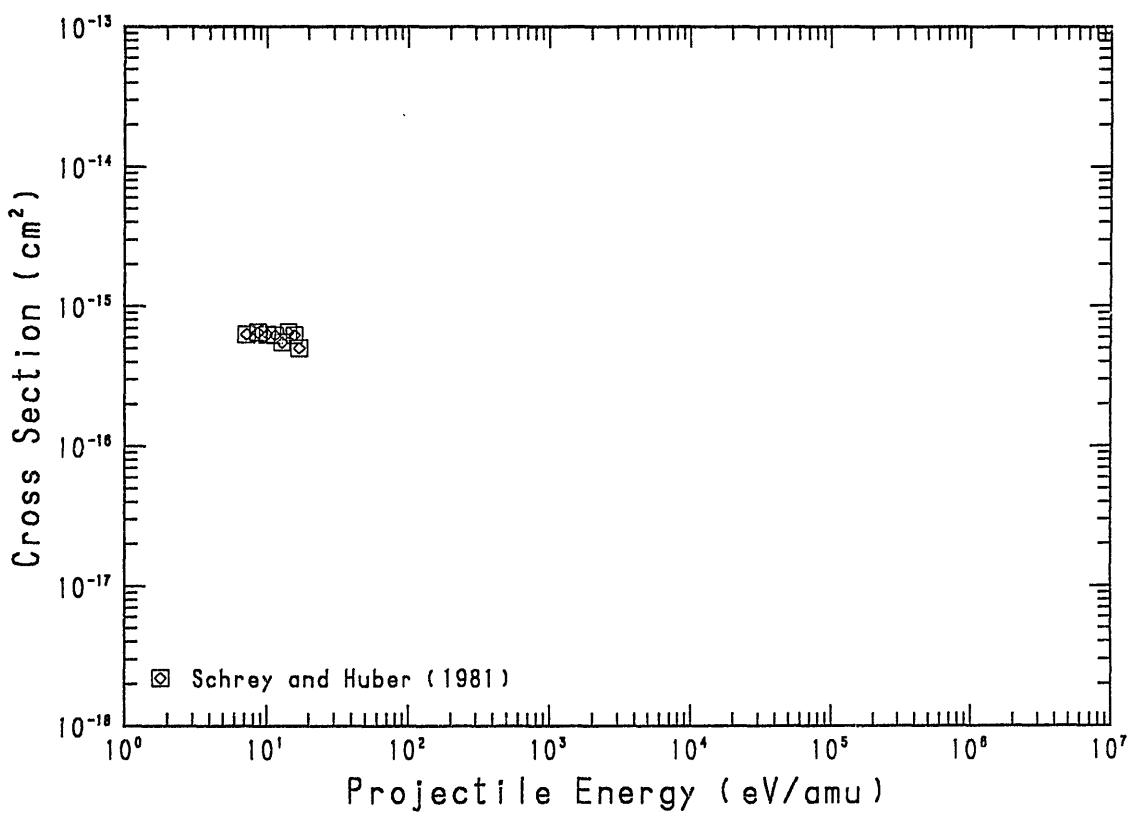


Fig. 253 $\text{Pb}^{3+} + \text{H}_2 \rightarrow \text{Pb}^{2+}$

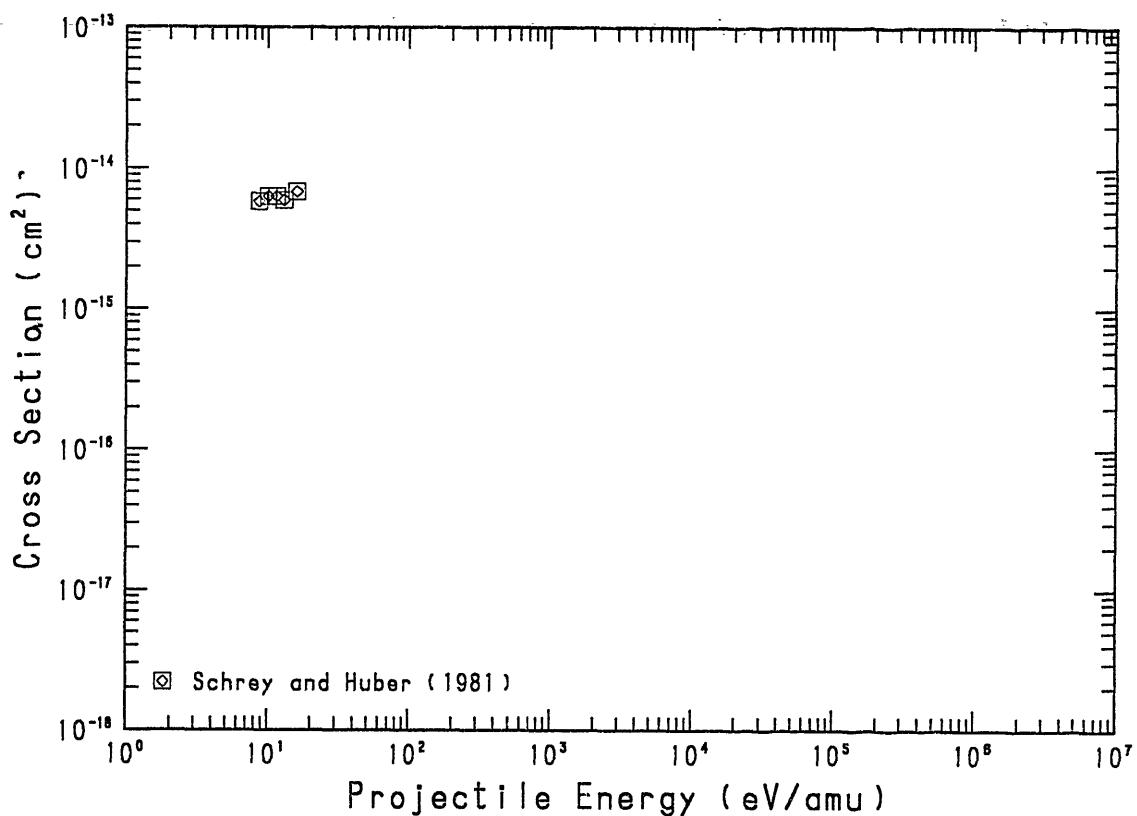


Fig. 254 $\text{Pb}^{4+} + \text{H}_2 \rightarrow \text{Pb}^{2+}$

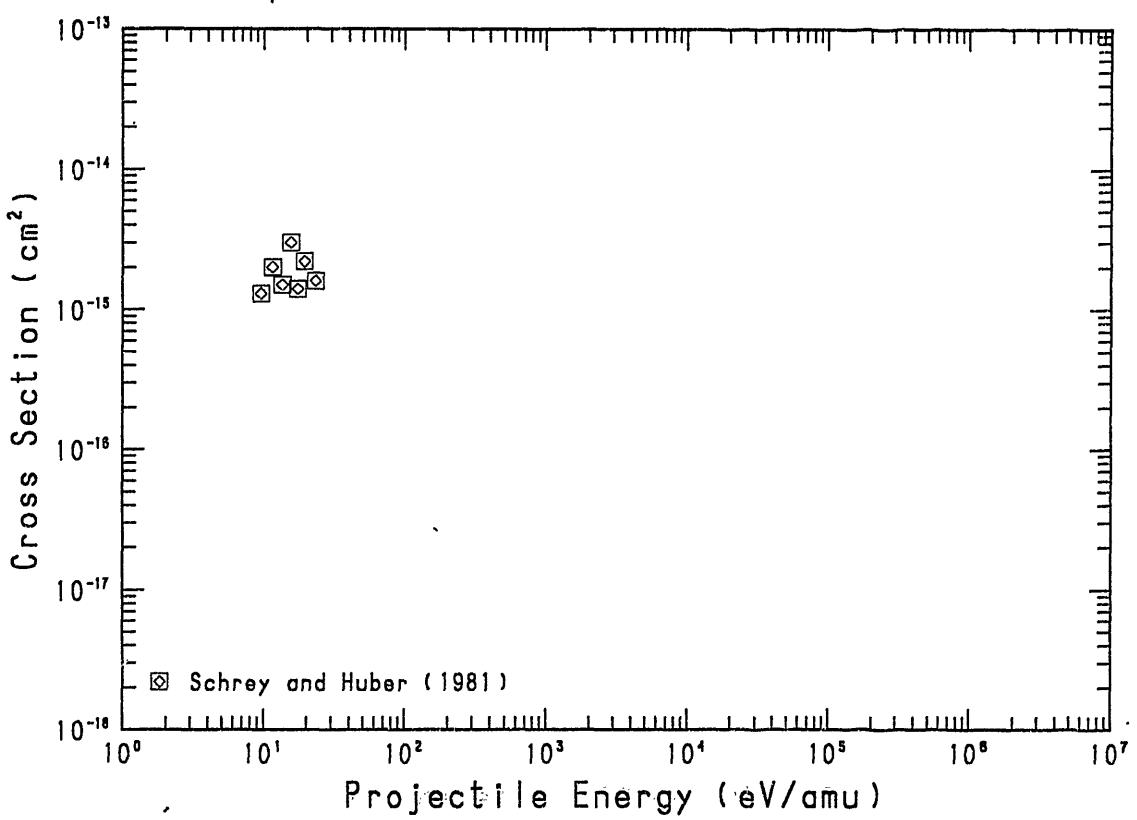


Fig. 255 $\text{Pb}^{4+} + \text{H}_2 \rightarrow \text{Pb}^{3+}$

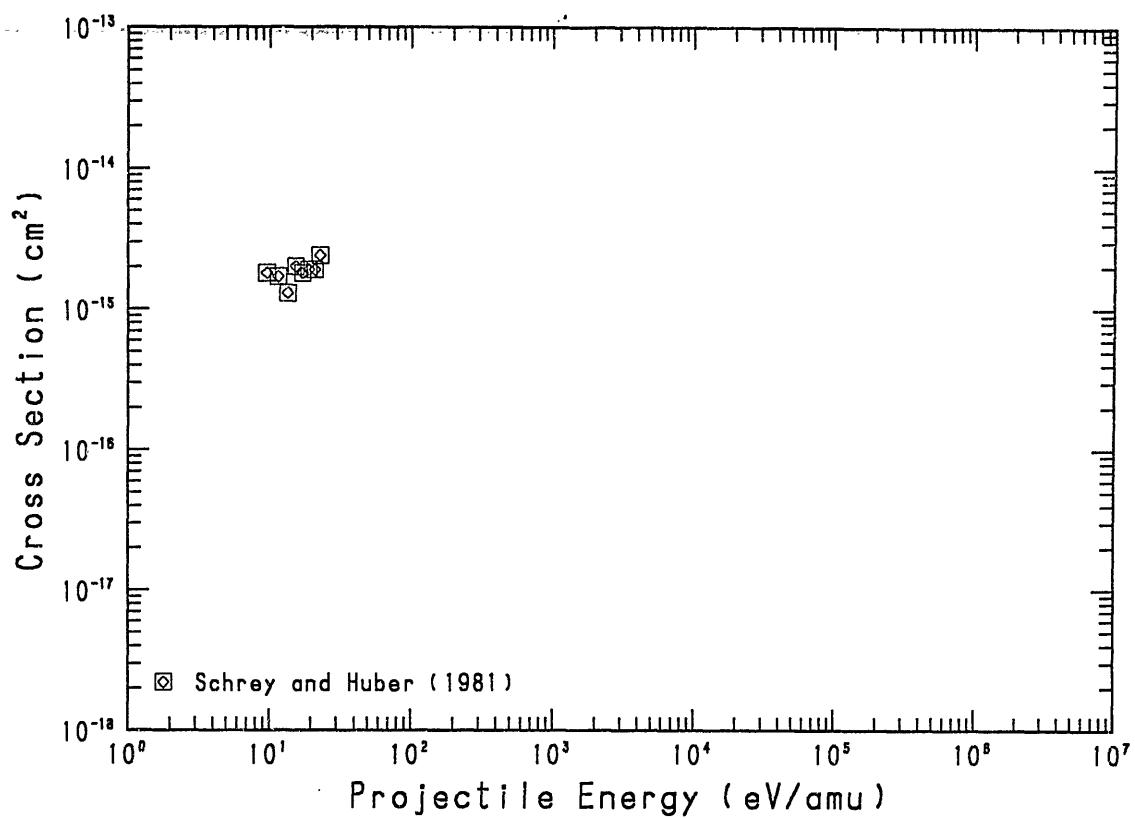


Fig. 256 $\text{Pb}^{5+} + \text{H}_2 \rightarrow \text{Pb}^{3+}$

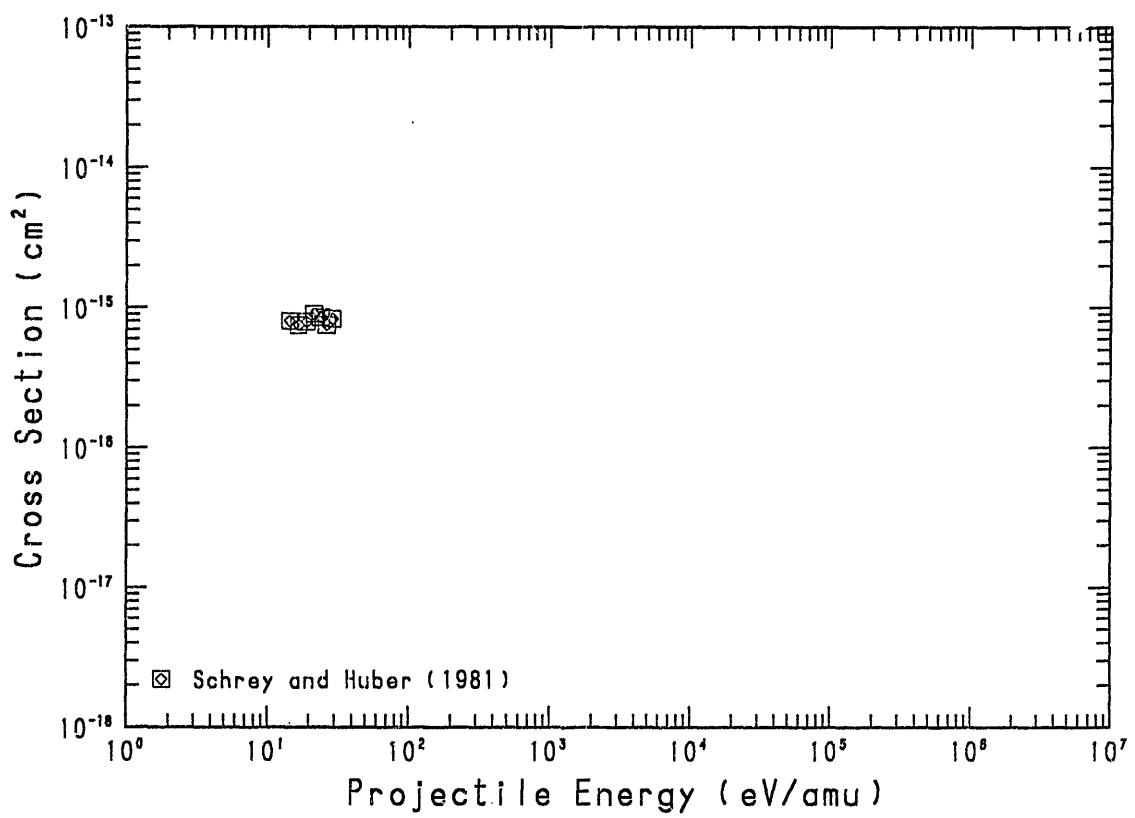


Fig. 257 $\text{Pb}^{5+} + \text{H}_2 \rightarrow \text{Pb}^{4+}$

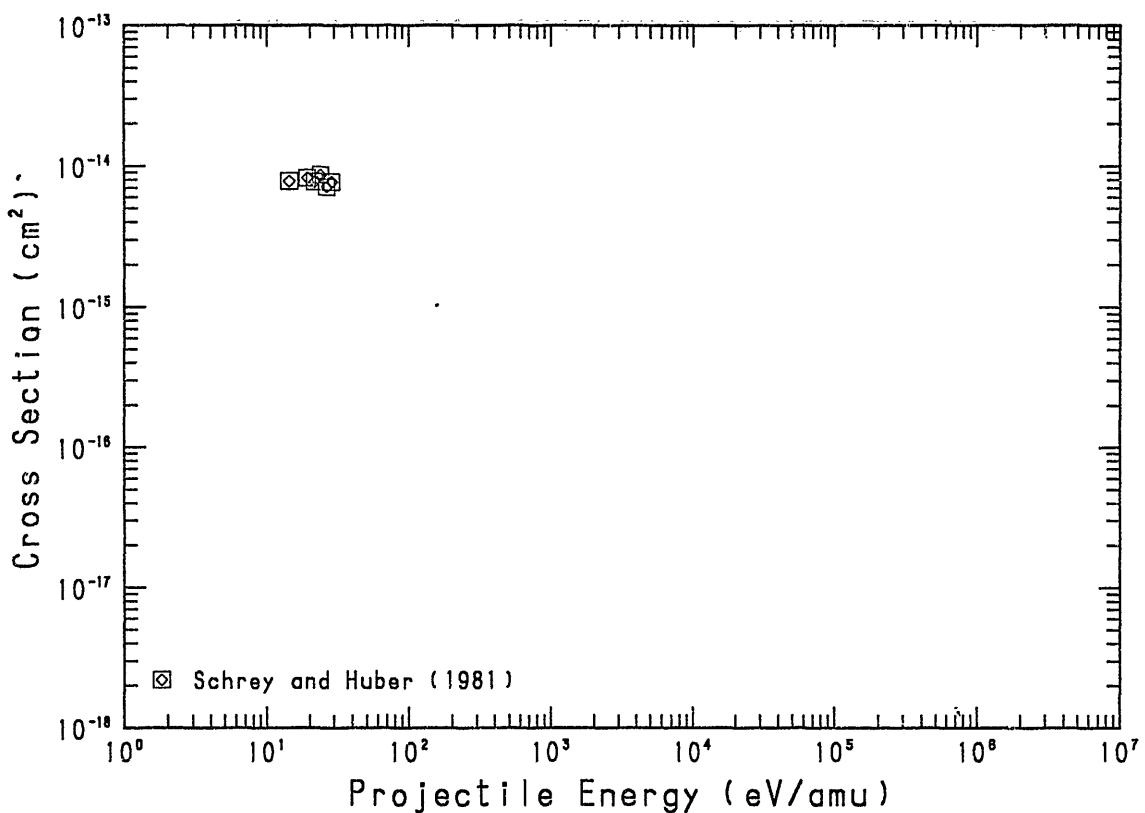


Fig. 258 $\text{Pb}^{6+} + \text{H}_2 \rightarrow \text{Pb}^{4+}$

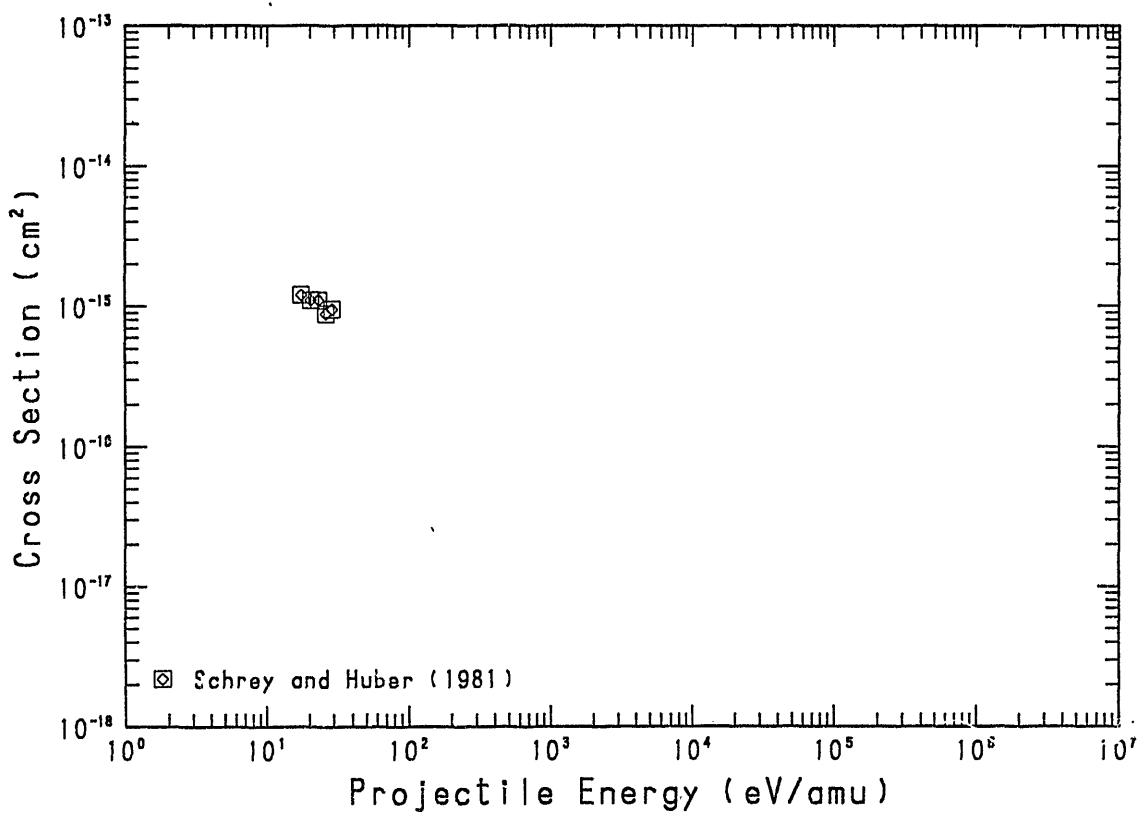


Fig. 259 $\text{Pb}^{6+} + \text{H}_2 \rightarrow \text{Pb}^{5+}$

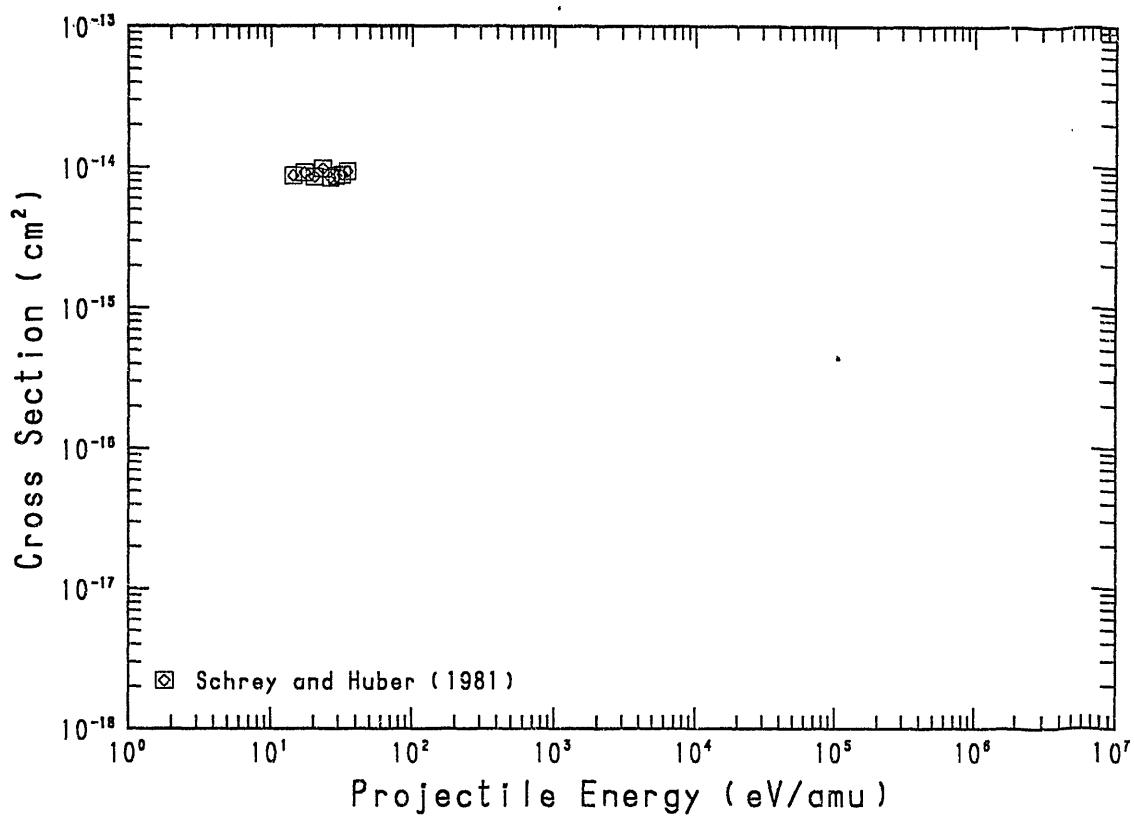


Fig. 260 $\text{Pb}^{7+} + \text{H}_2 \rightarrow \text{Pb}^{5+}$

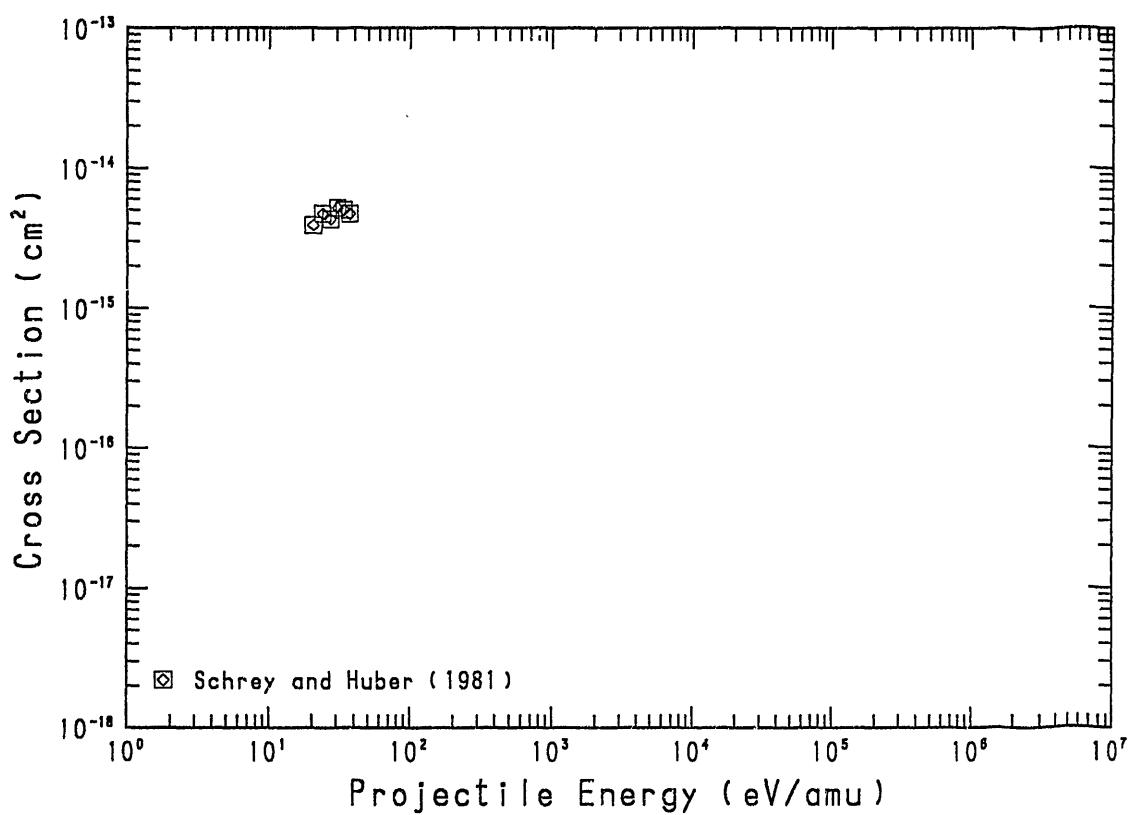


Fig. 261 $\text{Pb}^{7+} + \text{H}_2 \rightarrow \text{Pb}^{6+}$

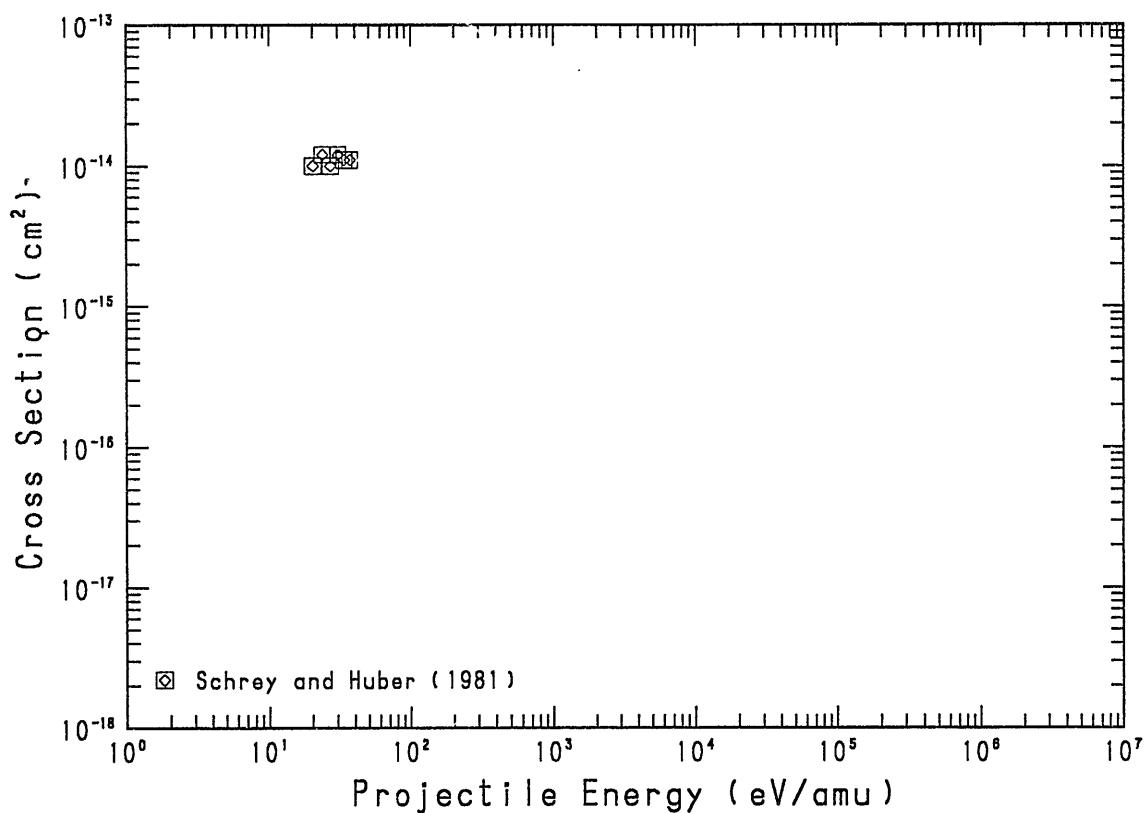


Fig. 262 $\text{Bi}^{2+} + \text{H}_2 \rightarrow \text{Bi}^+$

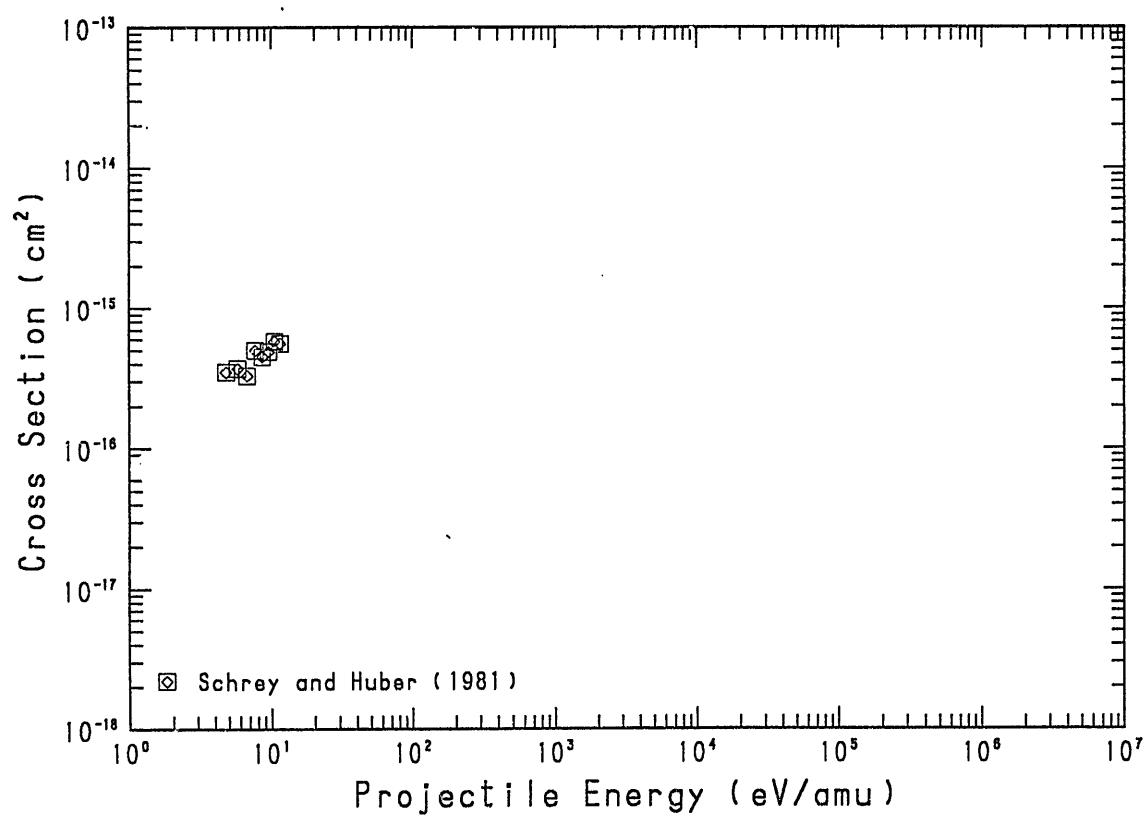


Fig. 263 $\text{Bi}^{3+} + \text{H}_2 \rightarrow \text{Bi}^+$

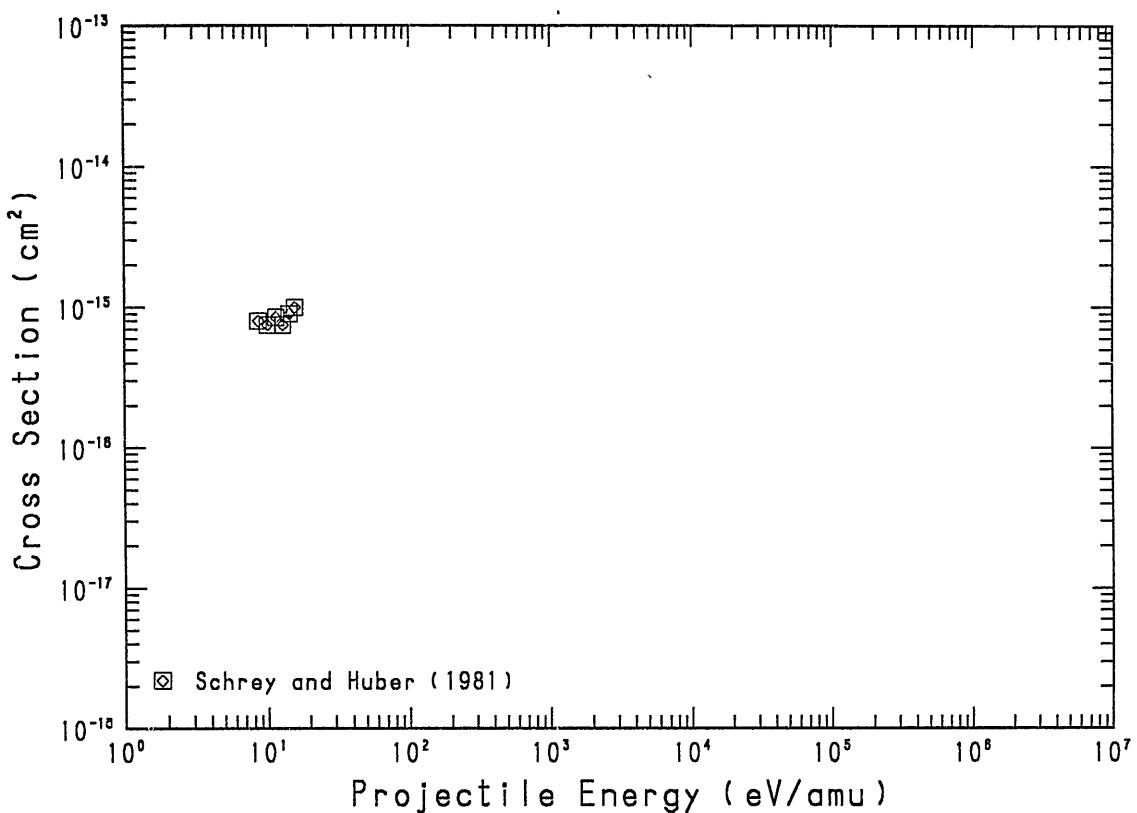


Fig. 264 $\text{Bi}^{3+} + \text{H}_2 \rightarrow \text{Bi}^{2+}$

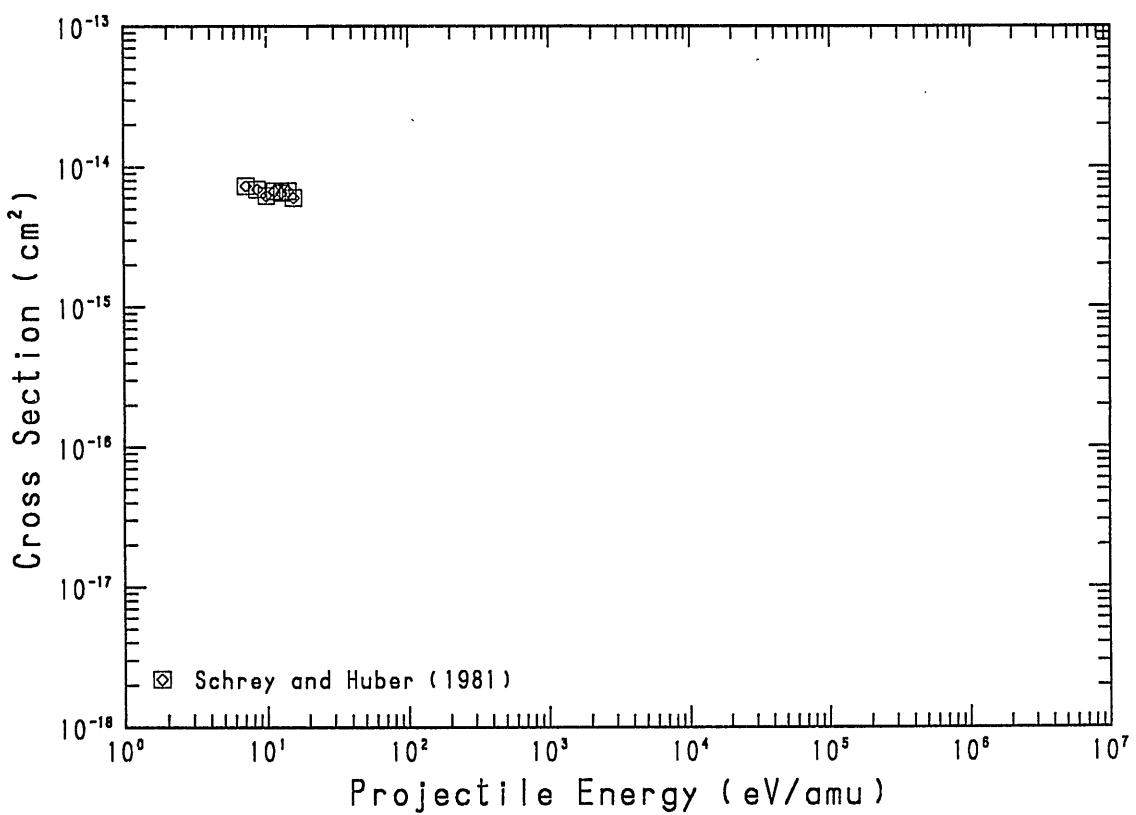


Fig. 265 $\text{Bi}^{4+} + \text{H}_2 \rightarrow \text{Bi}^{2+}$

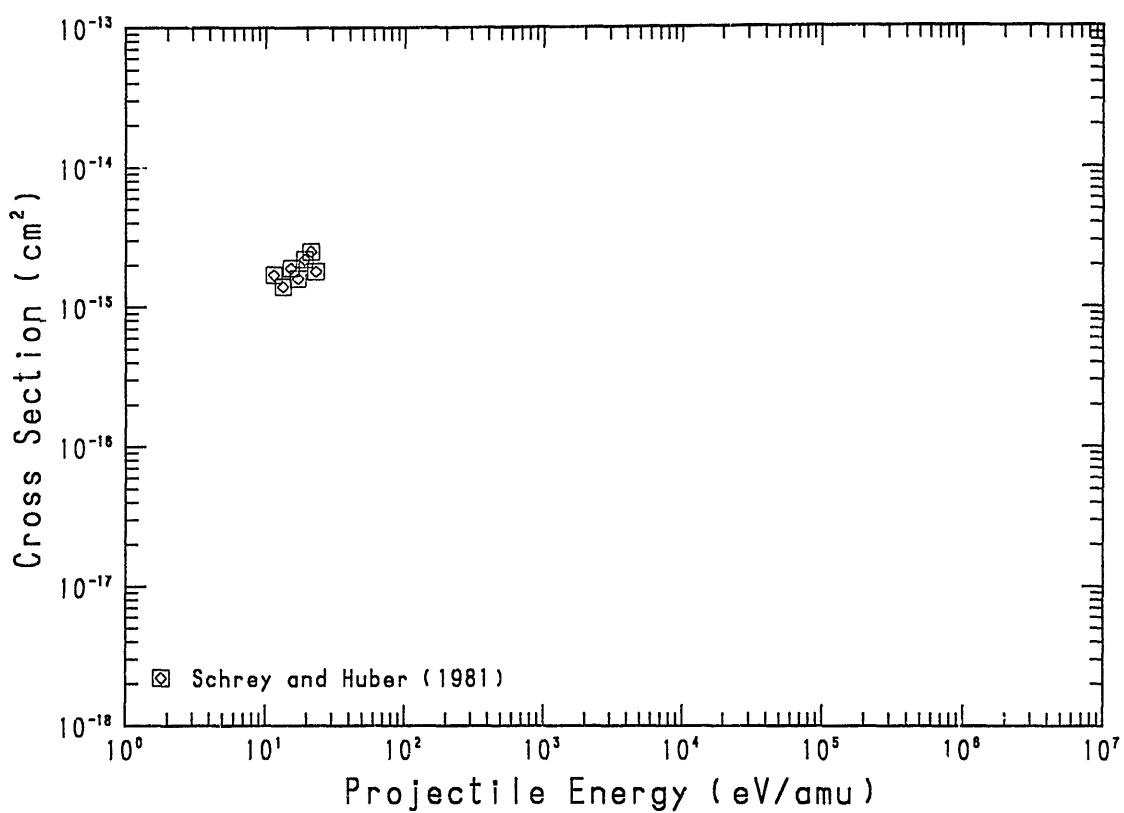


Fig. 266 $\text{Bi}^{4+} + \text{H}_2 \rightarrow \text{Bi}^{3+}$

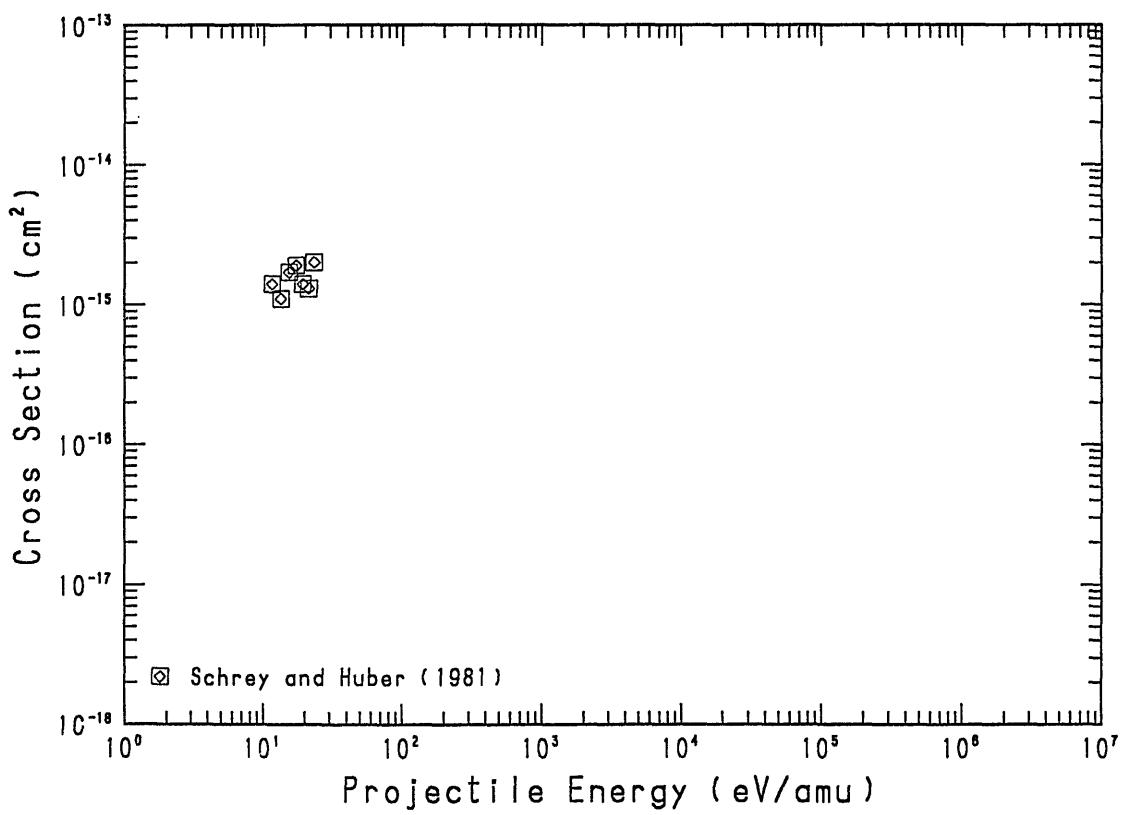


Fig. 267 $\text{Bi}^{5+} + \text{H}_2 \rightarrow \text{Bi}^{3+}$

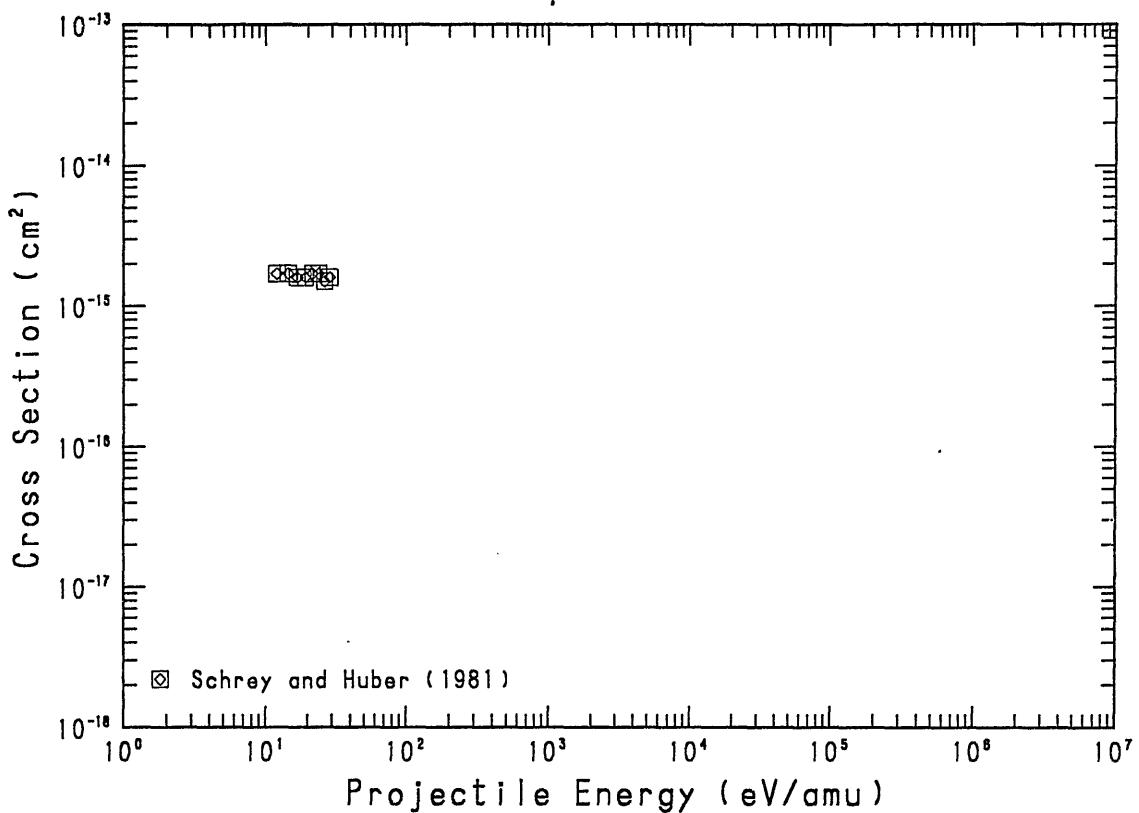


Fig. 268 $\text{Bi}^{5+} + \text{H}_2 \rightarrow \text{Bi}^{4+}$

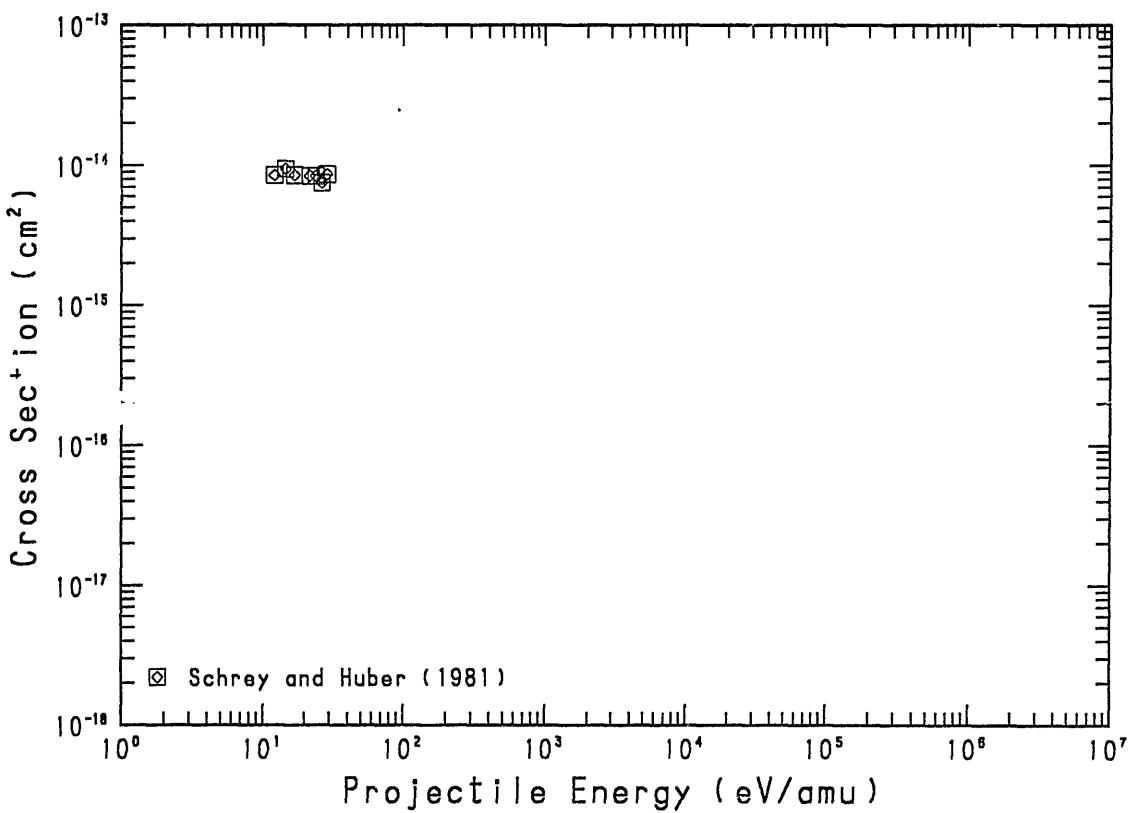


Fig. 269 $\text{Bi}^{6+} + \text{H}_2 \rightarrow \text{Bi}^{4+}$

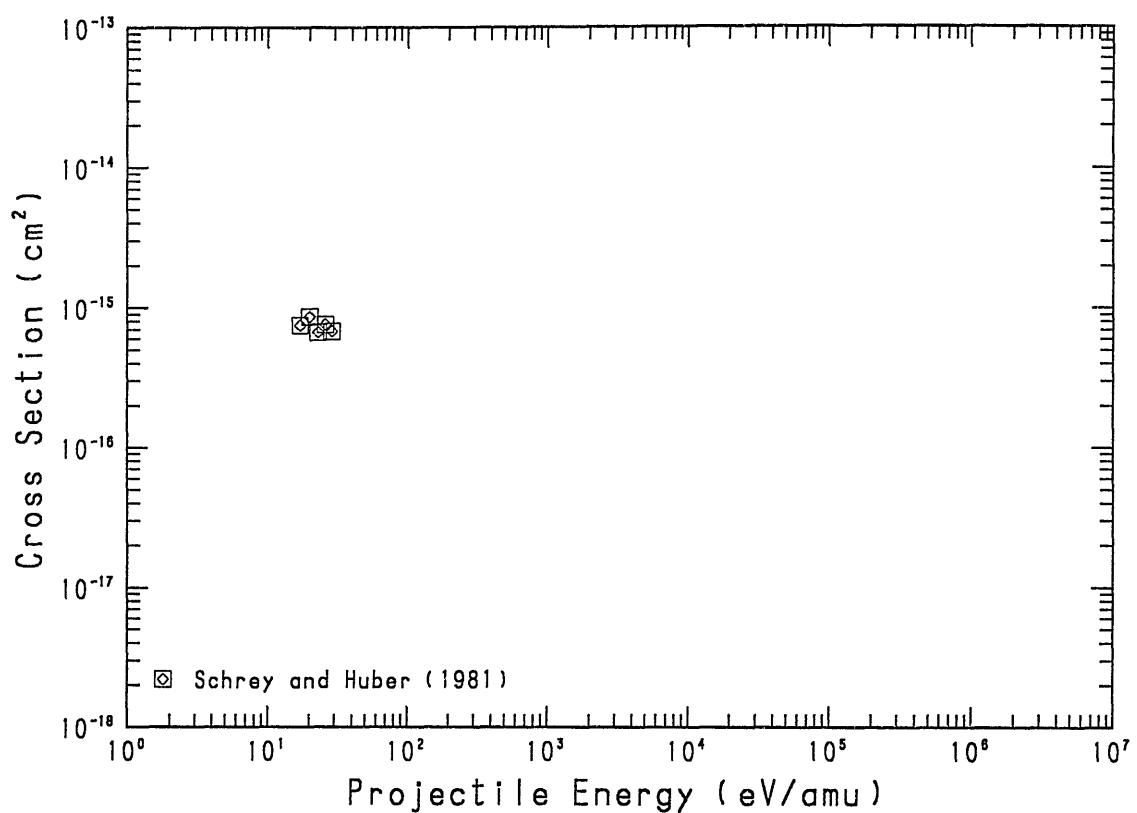


Fig. 270 $\text{Bi}^{6+} + \text{H}_2 \rightarrow \text{Bi}^{5+}$

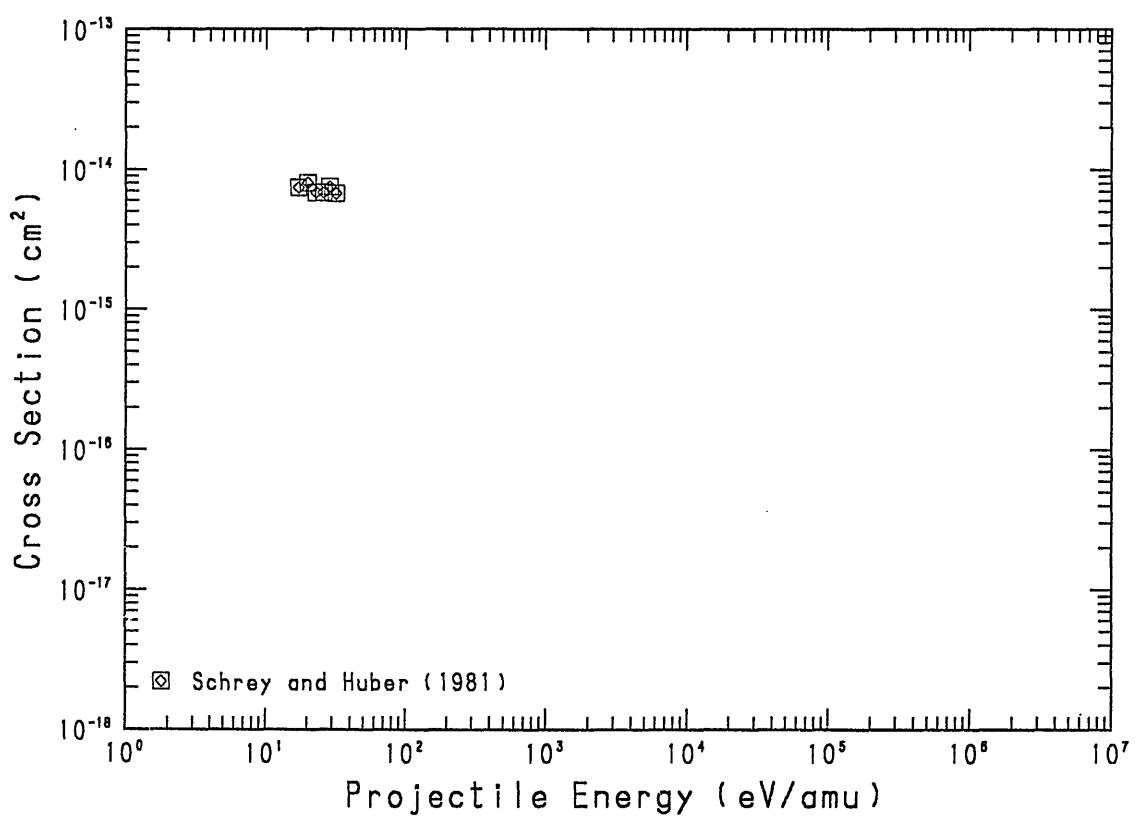


Fig. 27.1 $\text{Bi}^{7+} + \text{H}_2 \rightarrow \text{Bi}^{5+}$

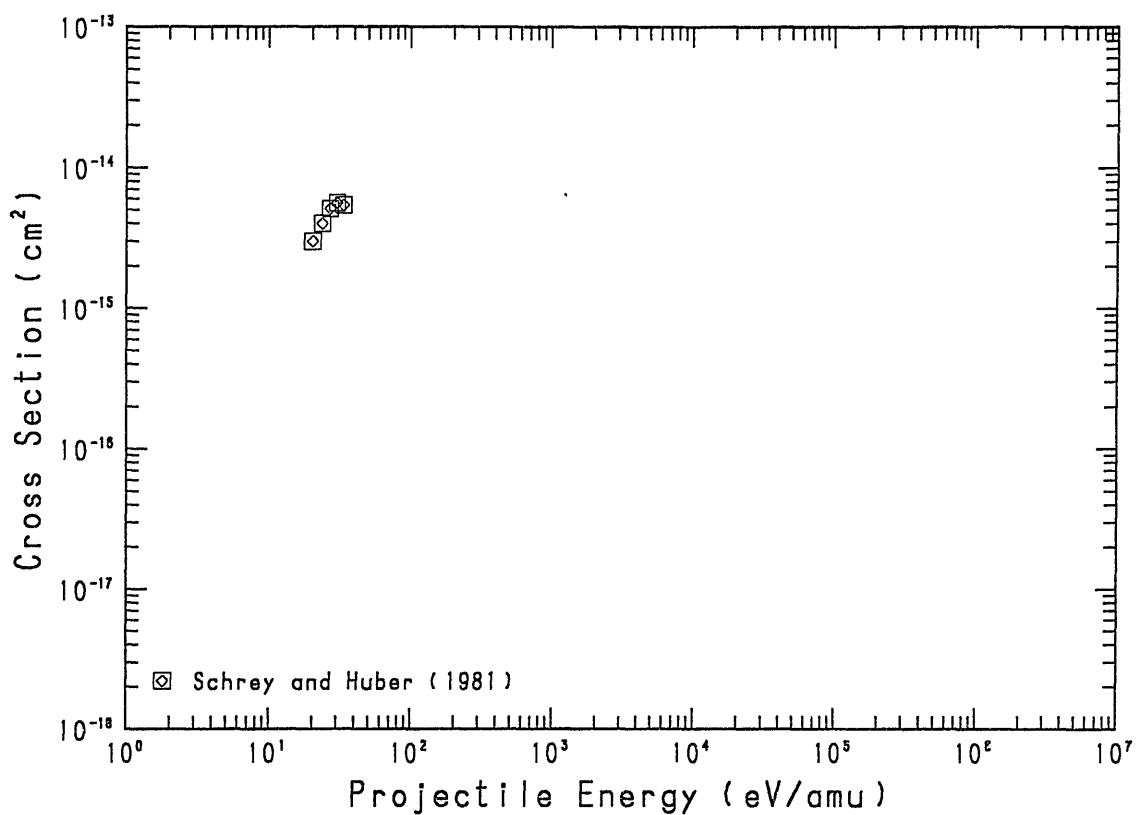
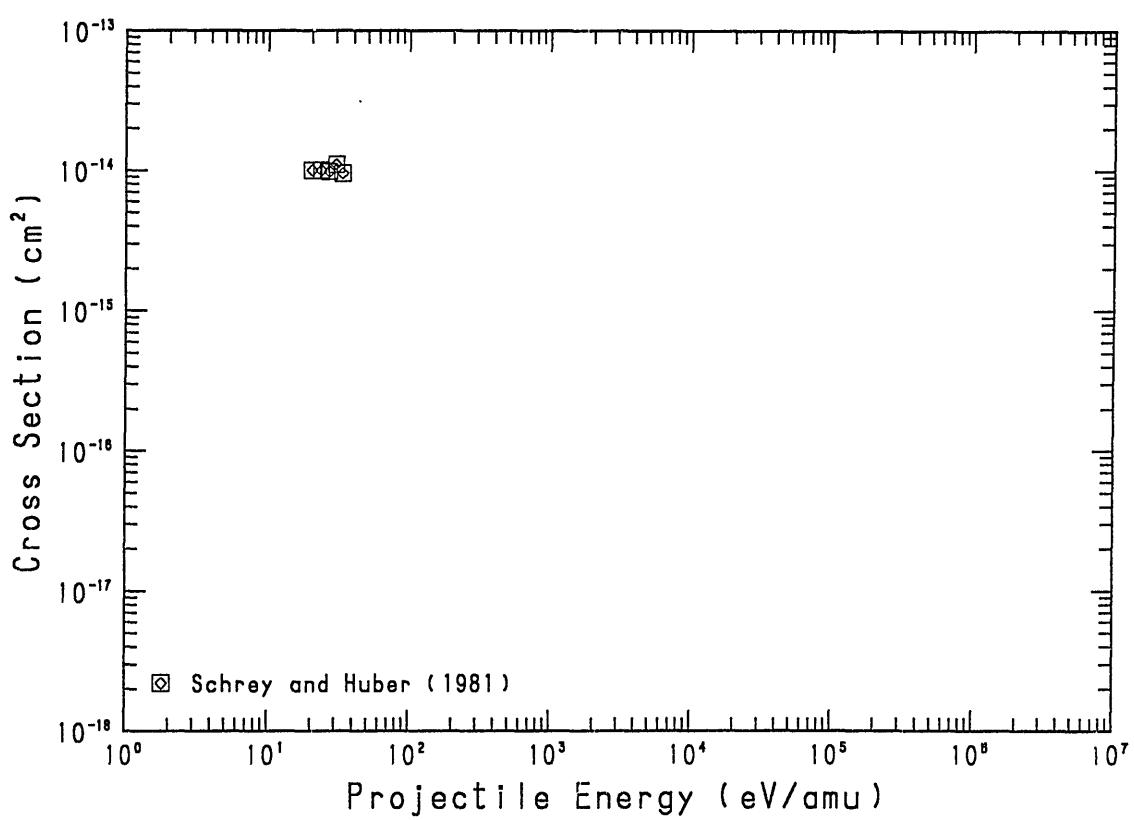


Fig. 27.2 $\text{Bi}^{7+} + \text{H}_2 \rightarrow \text{Bi}^{6+}$



IV. FIGURES

— CROSS SECTIONS FOR $H_2 + X^{q+} \rightarrow H_2 + X^{(q+n)+} -$

Fig.A1 $\text{Li}^+ + \text{H}_2 \rightarrow \text{Li}^{2+}$

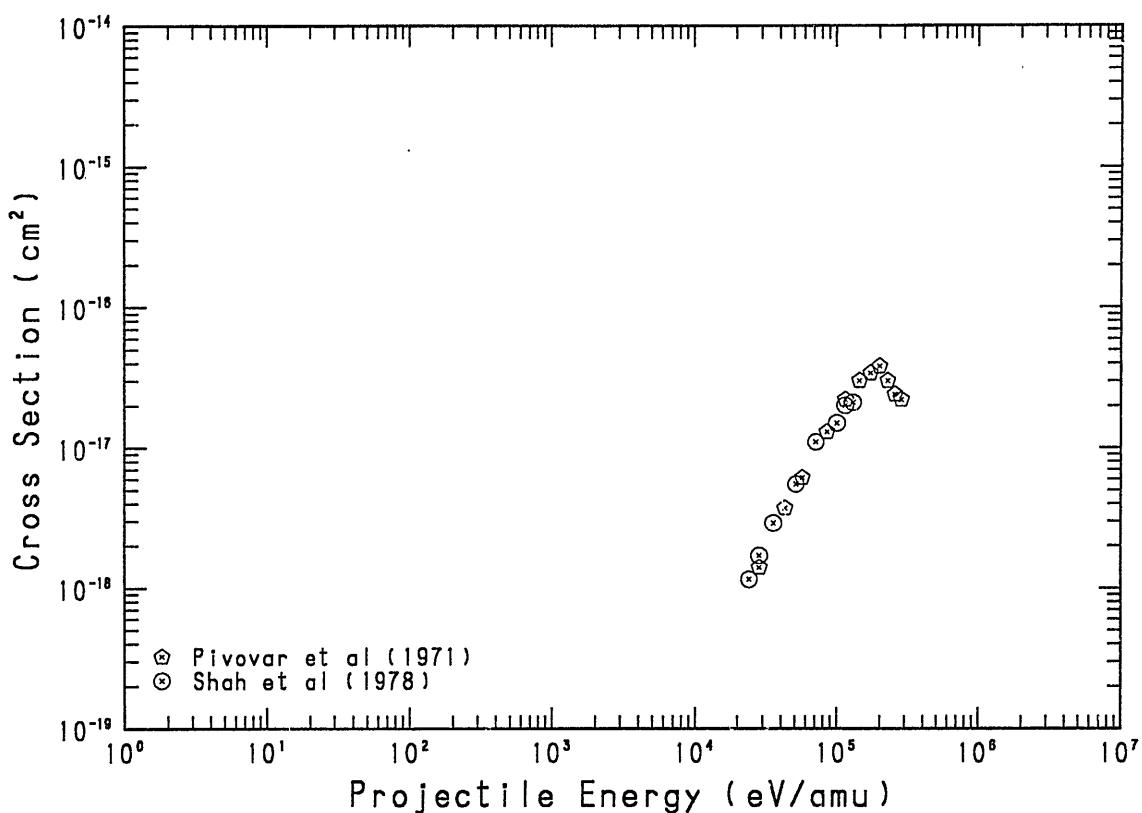


Fig.A2 $\text{Li}^{2+} + \text{H}_2 \rightarrow \text{Li}^{3+}$

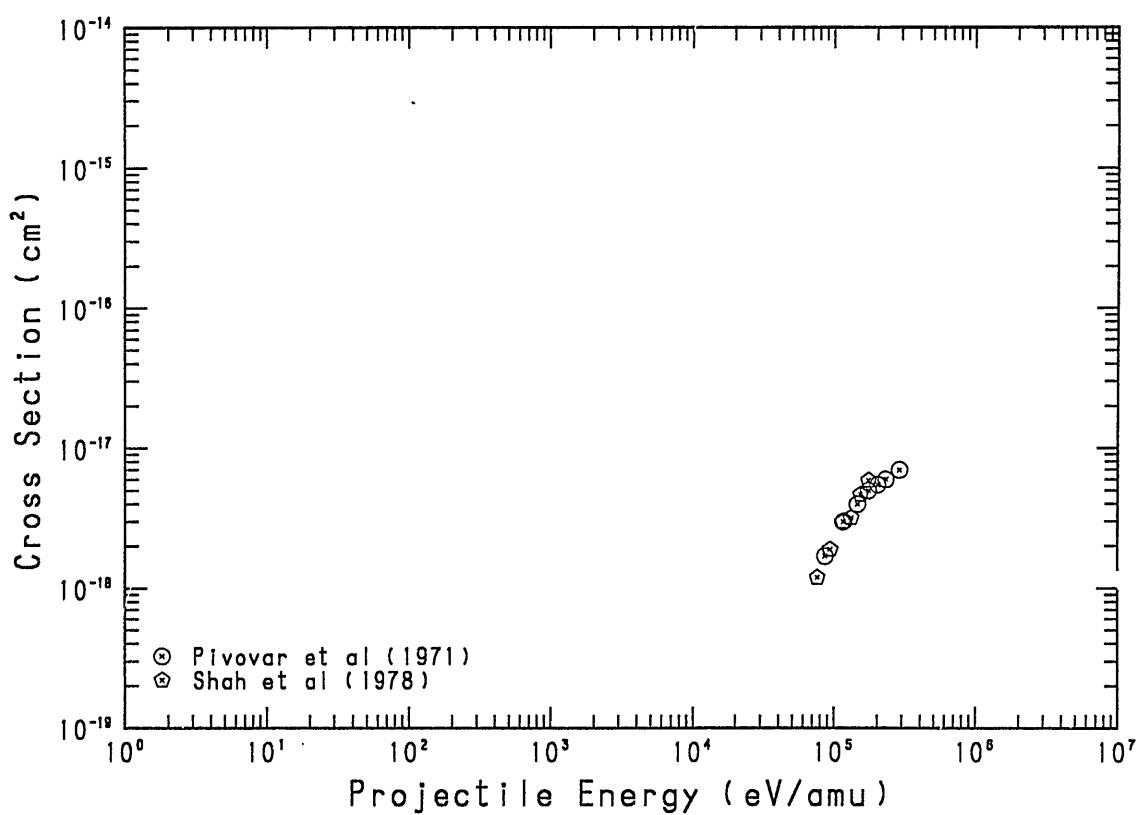


Fig.A3 $B^+ + H_2 \rightarrow B^{2+}$

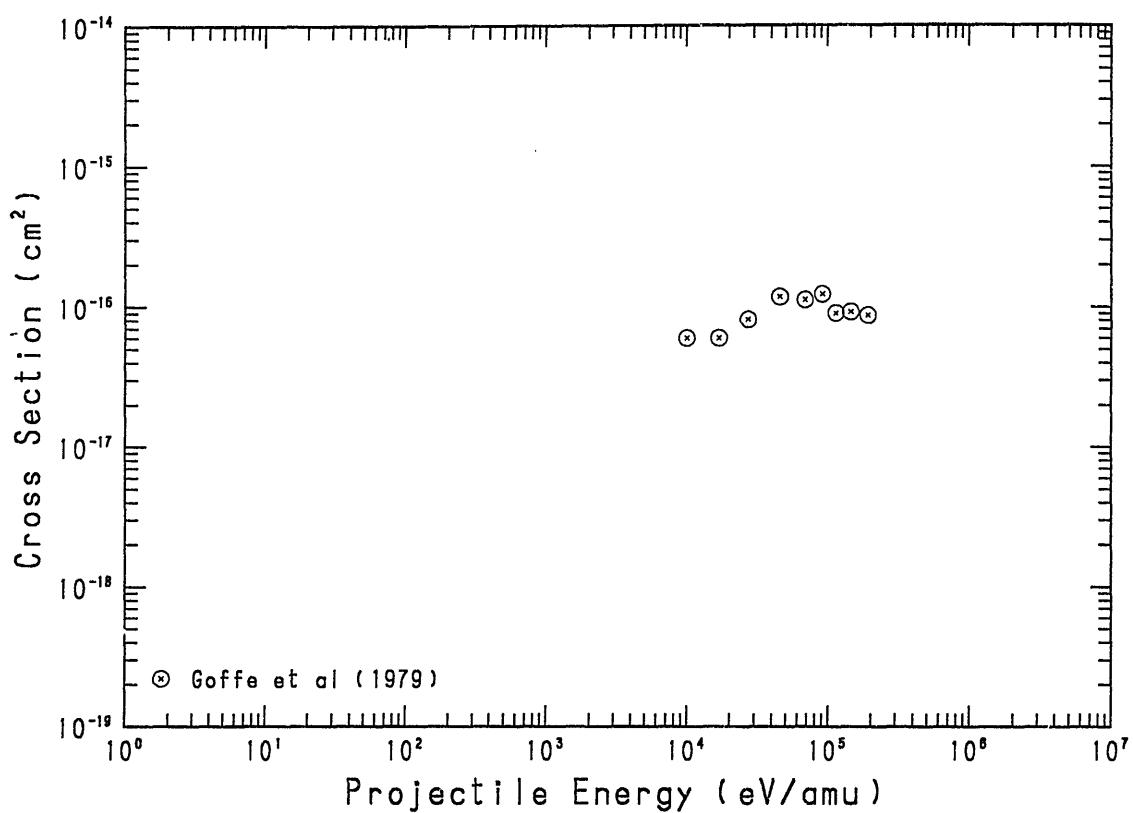


Fig.A4 $B^{2+} + H_2 \rightarrow B^{3+}$

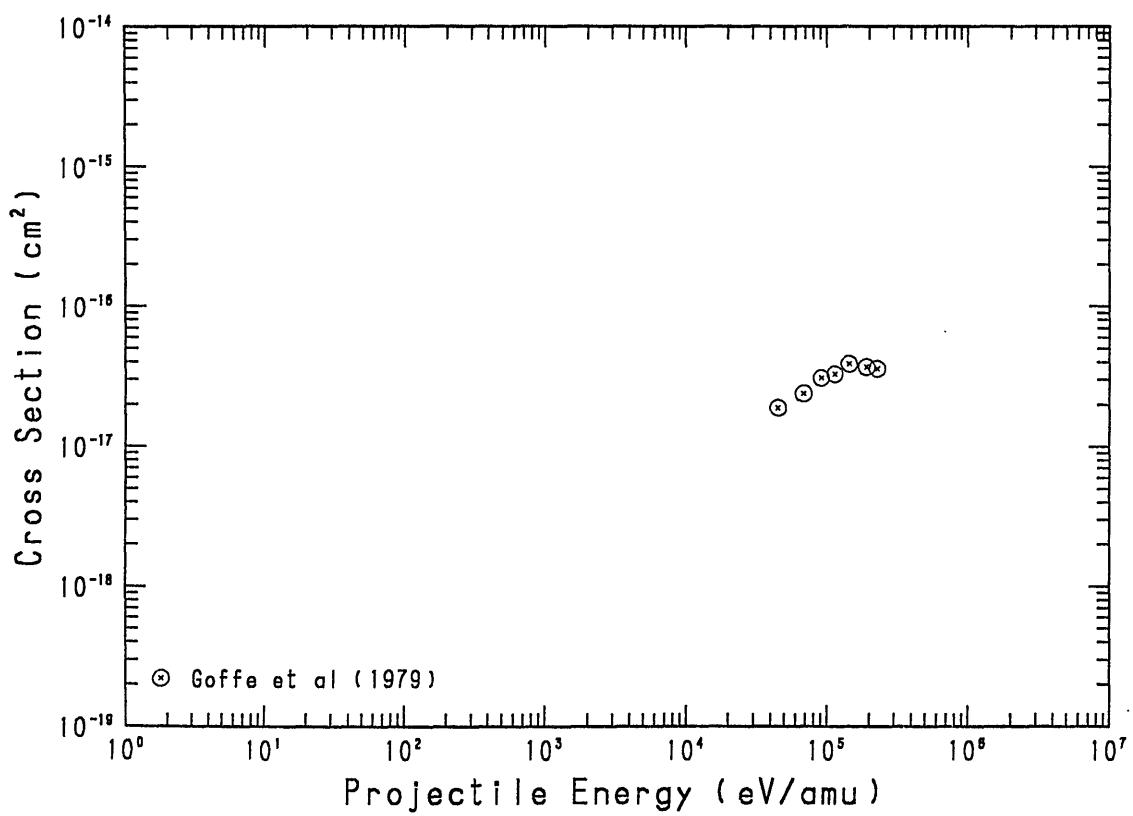


Fig.A5. $\text{C}^+ + \text{H}_2 \rightarrow \text{C}^{2+}$

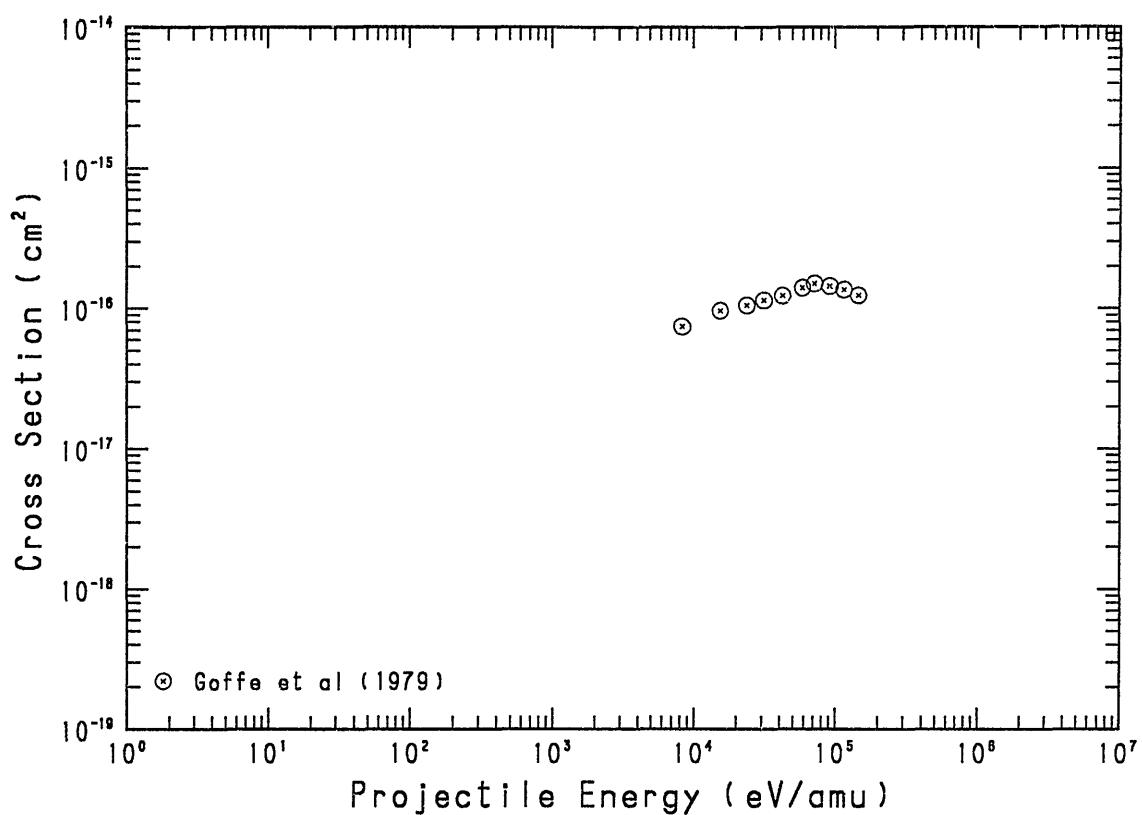


Fig.A6 $\text{C}^{2+} + \text{H}_2 \rightarrow \text{C}^{3+}$

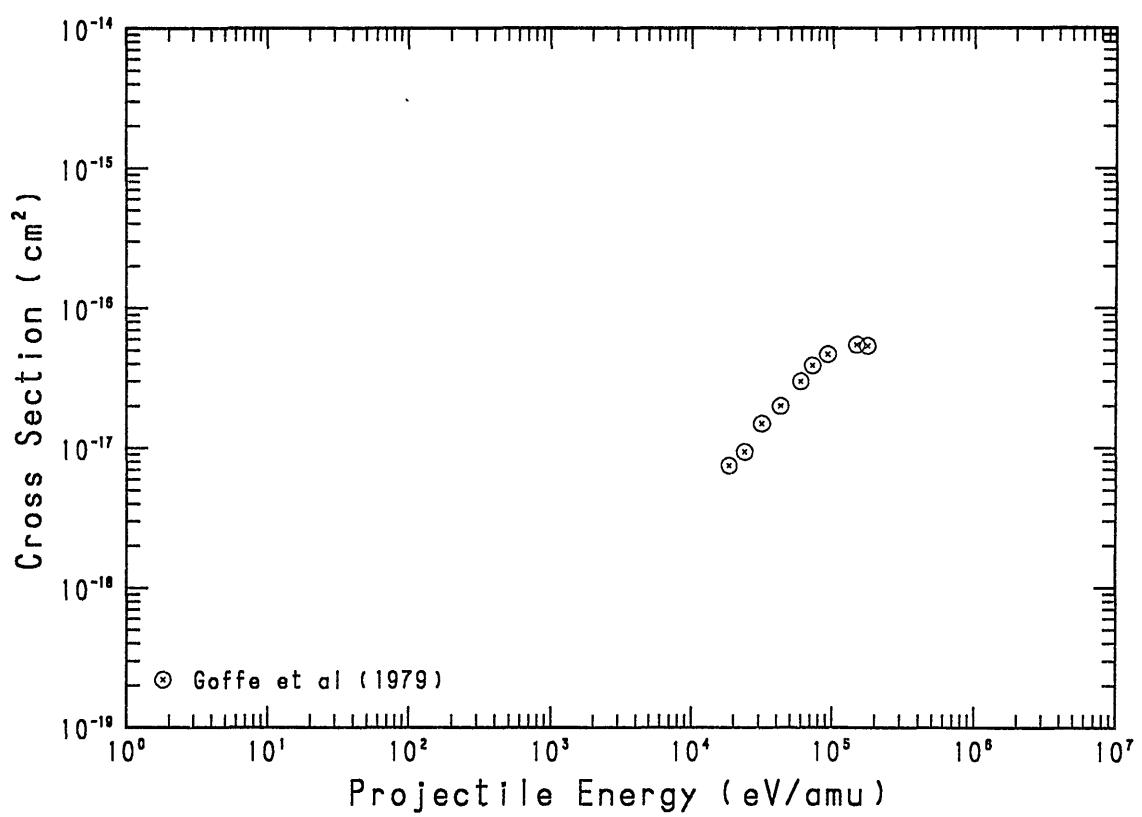


Fig.A7 $\text{C}^{3+} + \text{H}_2 \rightarrow \text{C}^{4+}$

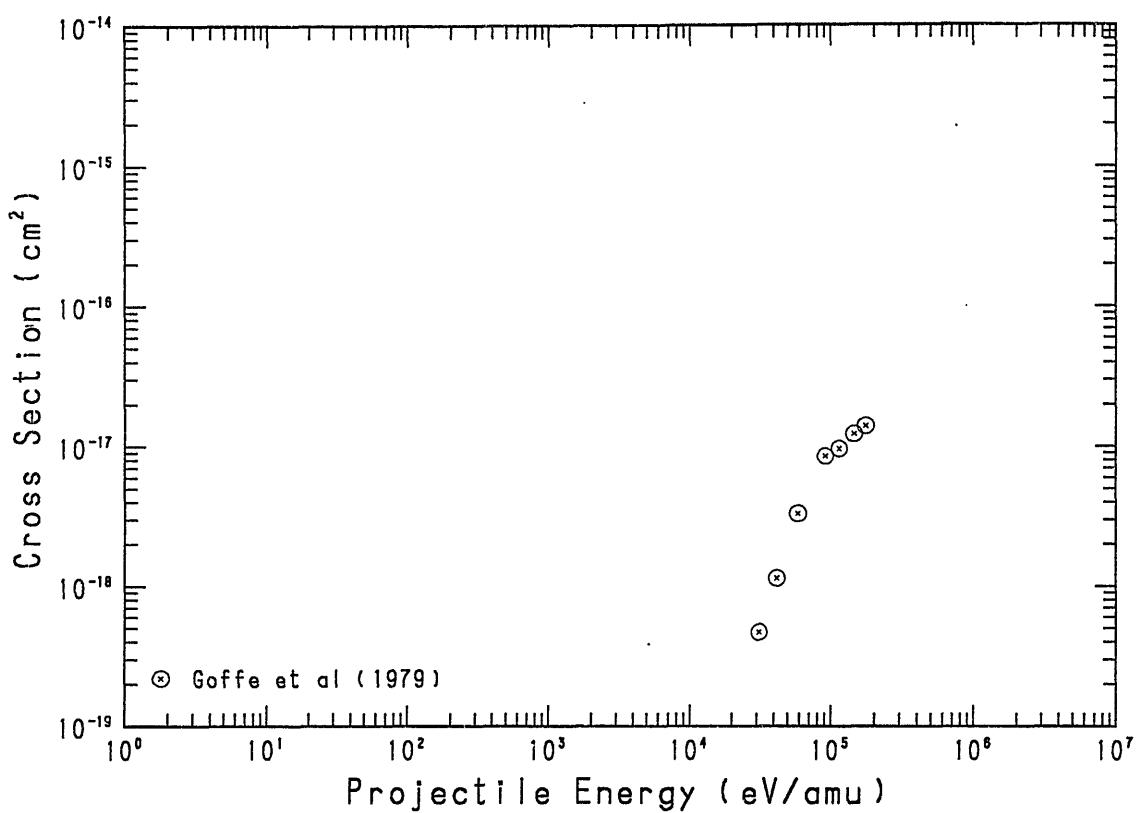


Fig.A8 $\text{C}^{4+} + \text{H}_2 \rightarrow \text{C}^{5+}$

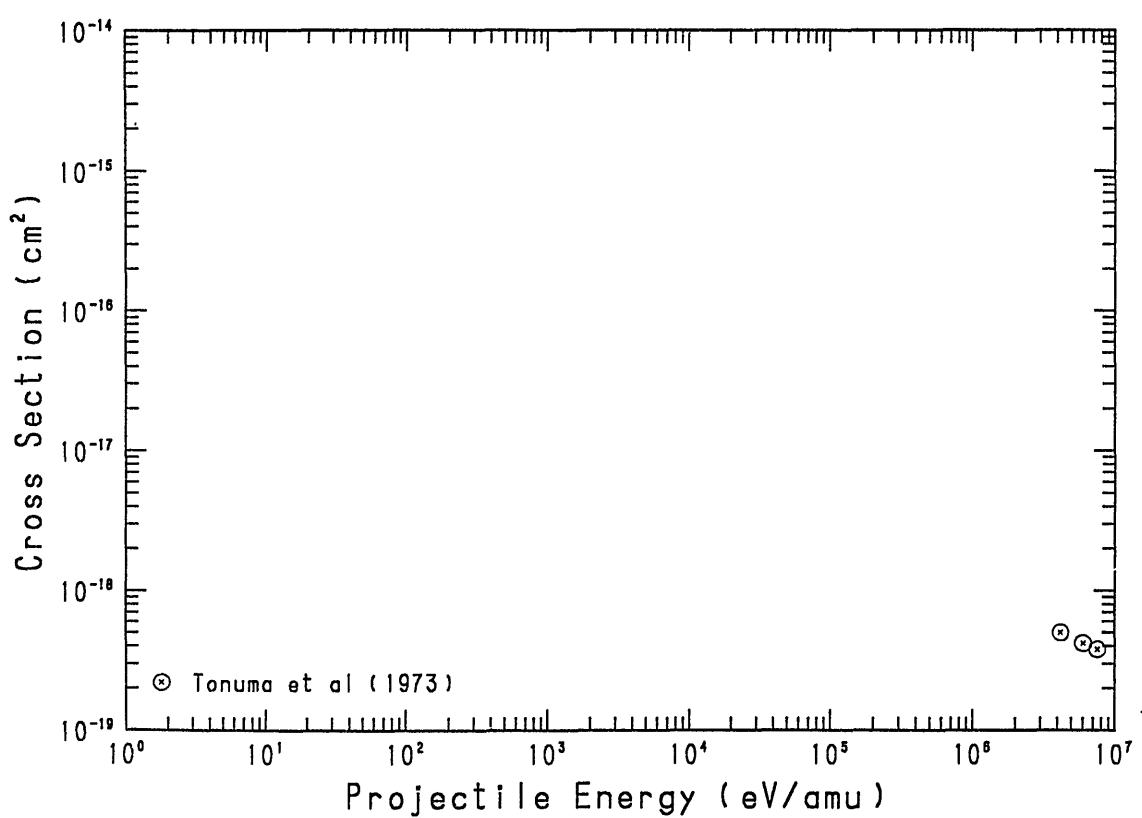


Fig.A9. $\text{N}^{4+} + \text{H}_2 \rightarrow \text{N}^{5+}$

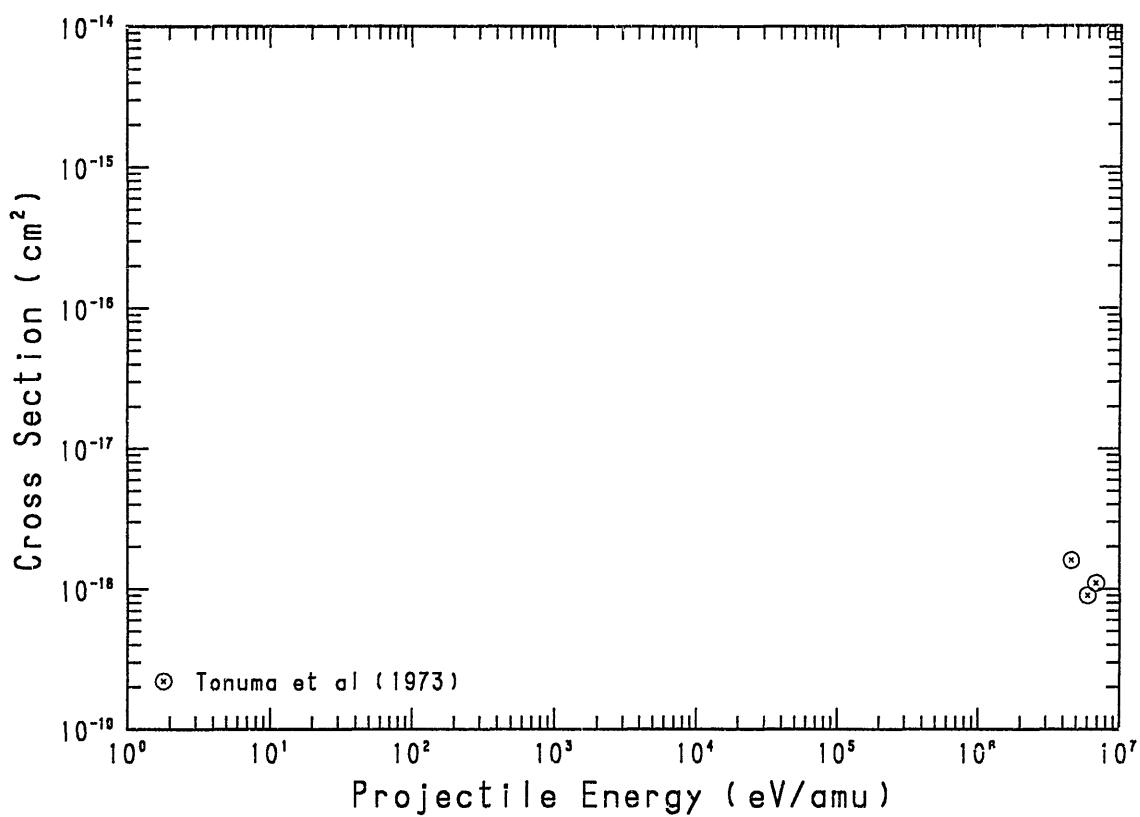


Fig.A10 $\text{O}^{2+} + \text{H}_2 \rightarrow \text{O}^{3+}$

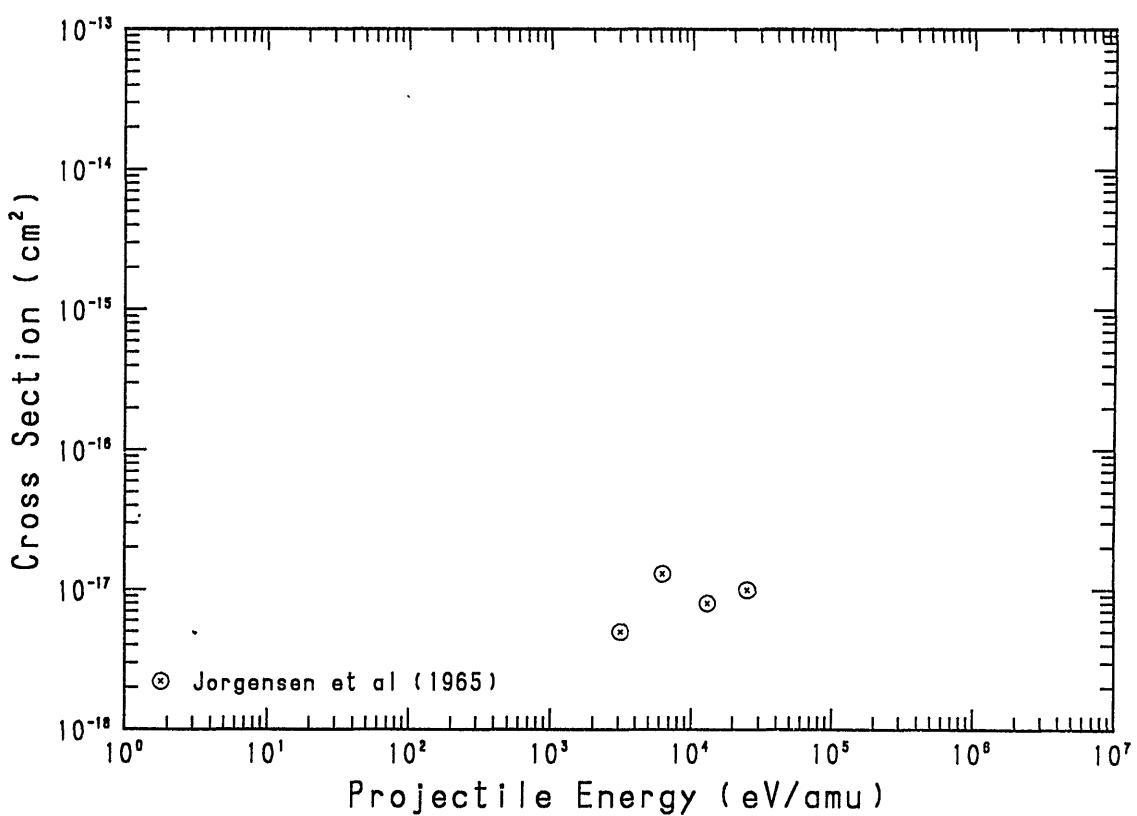


Fig.A11 $\text{Si}^{3+} + \text{H}_2 \rightarrow \text{Si}^{4+}$

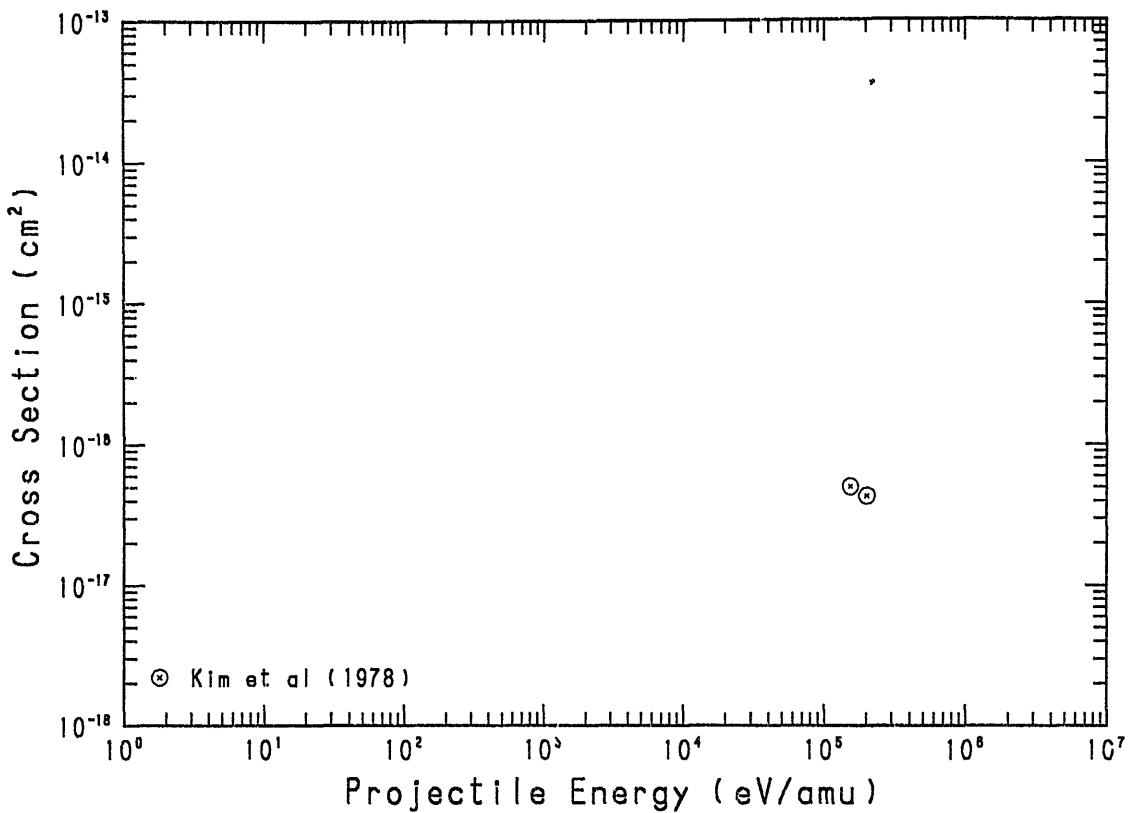


Fig.A12 $\text{Si}^{4+} + \text{H}_2 \rightarrow \text{Si}^{5+}$

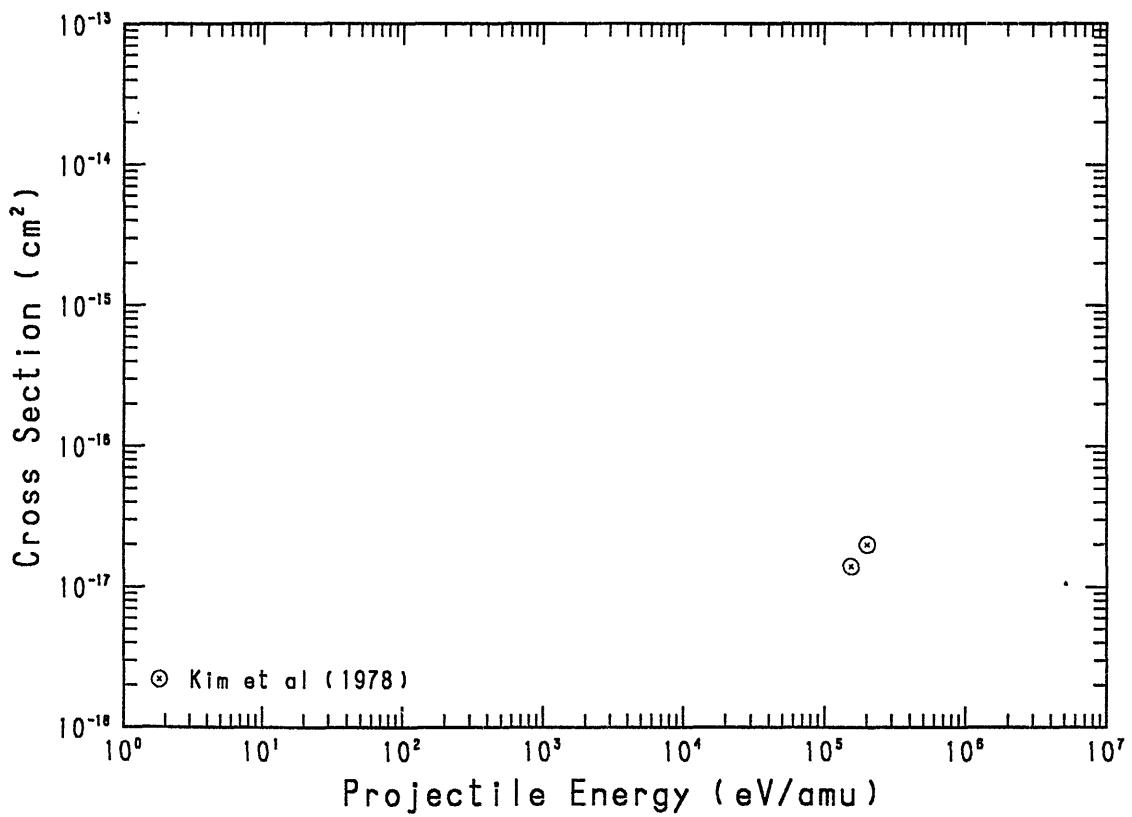


Fig.A13. $\text{Cl}^{2+} + \text{H}_2 \rightarrow \text{Cl}^{3+}$

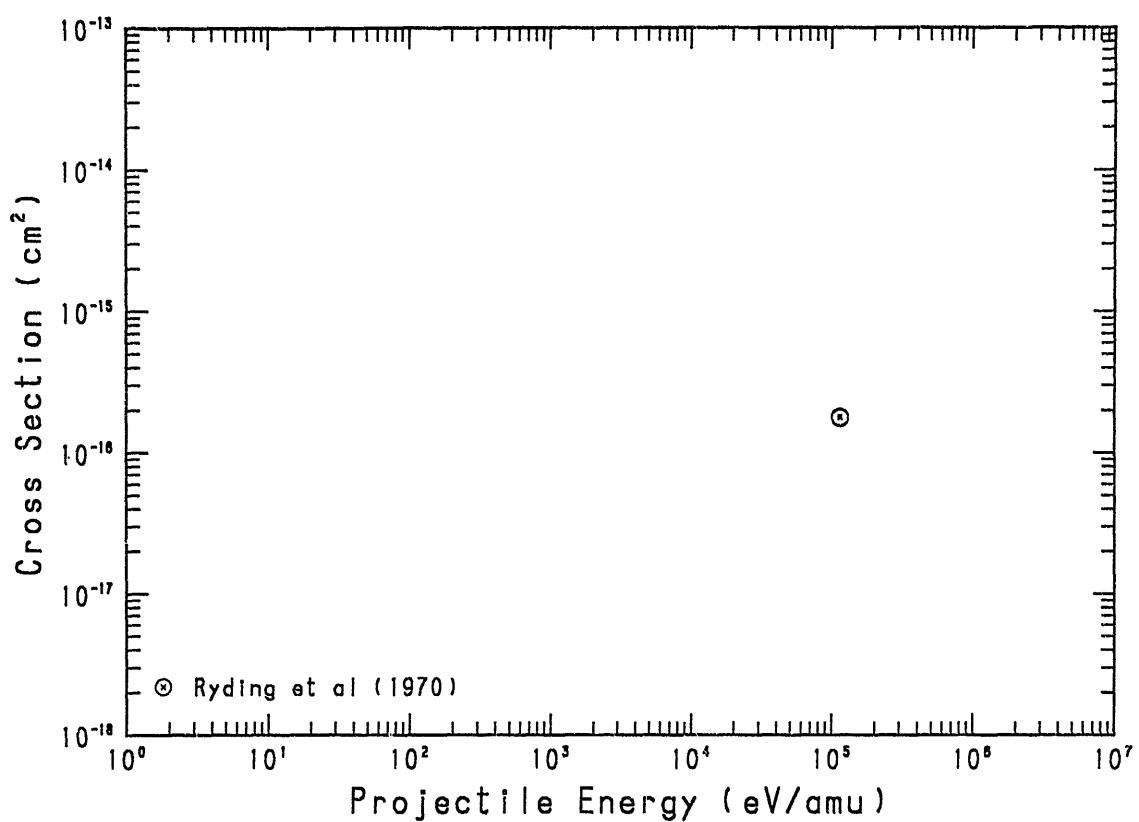


Fig.A14 $\text{Cl}^{3+} + \text{H}_2 \rightarrow \text{Cl}^{4+}$

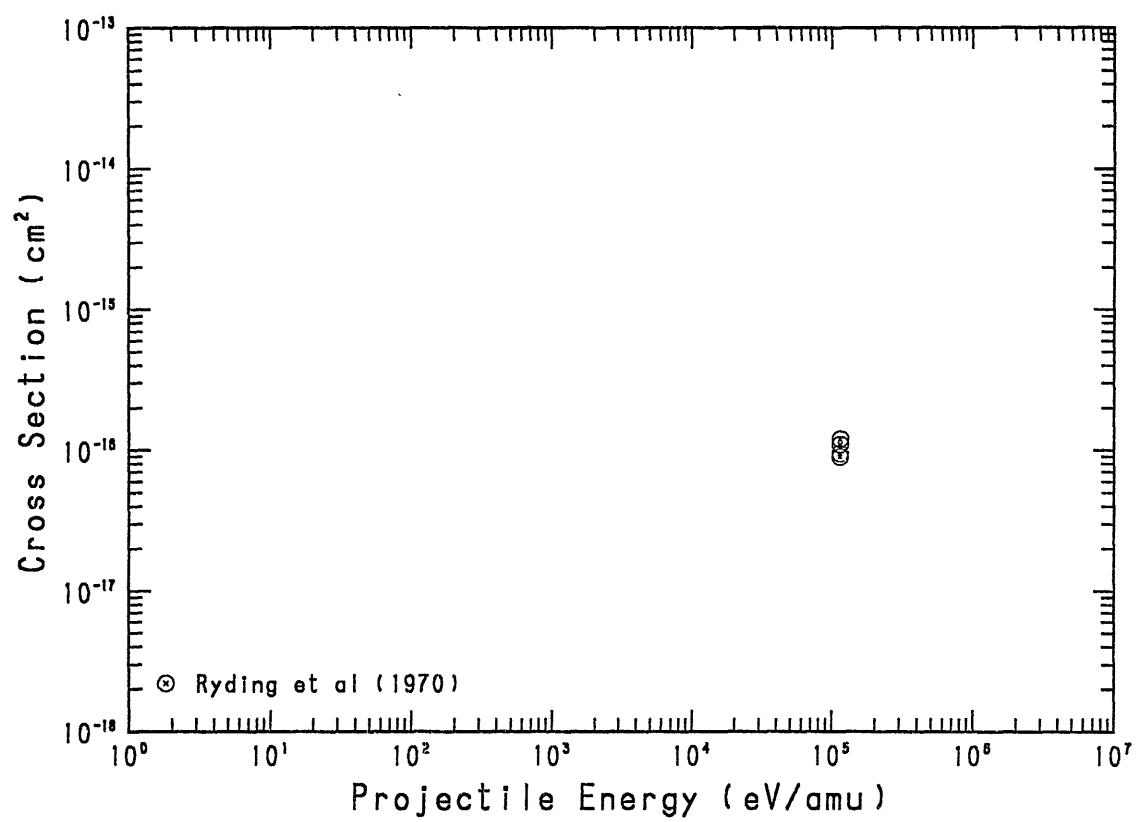


Fig.A15 $K^+ + H_2 \rightarrow K^{2+}$

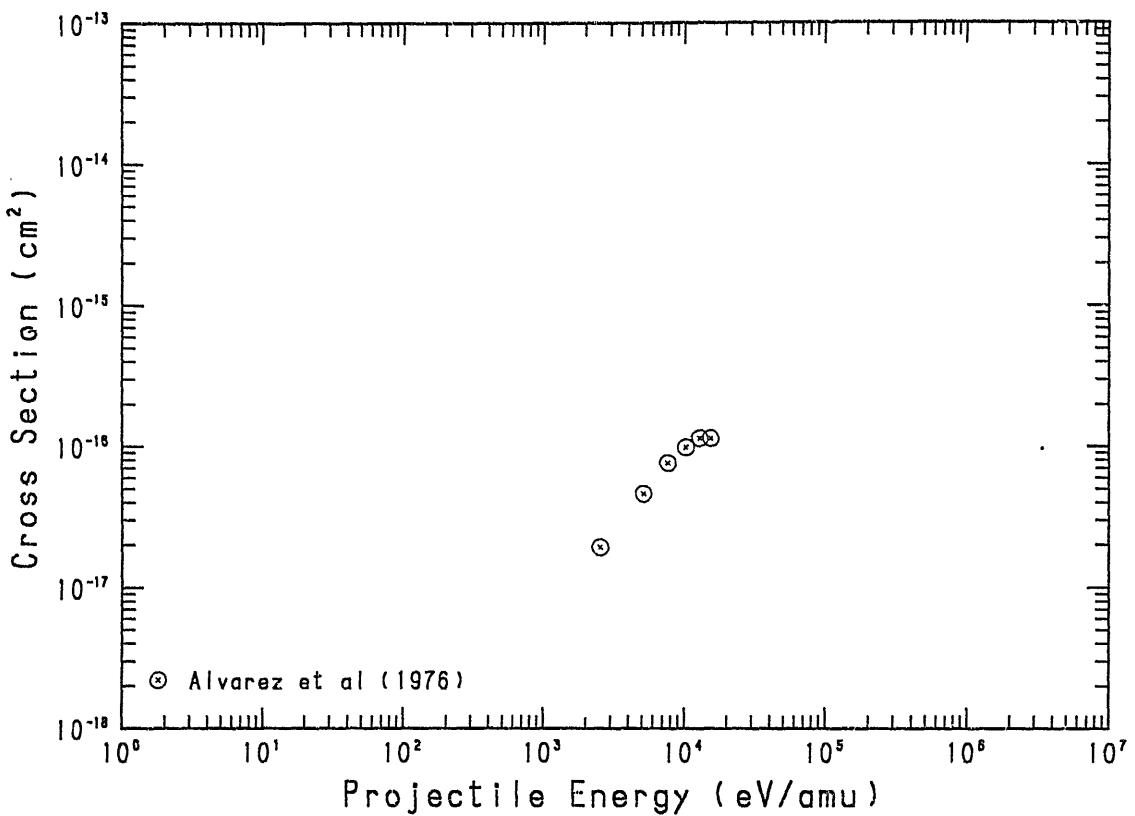


Fig.A16 $Fe^{3+} + H_2 \rightarrow Fe^{4+}$

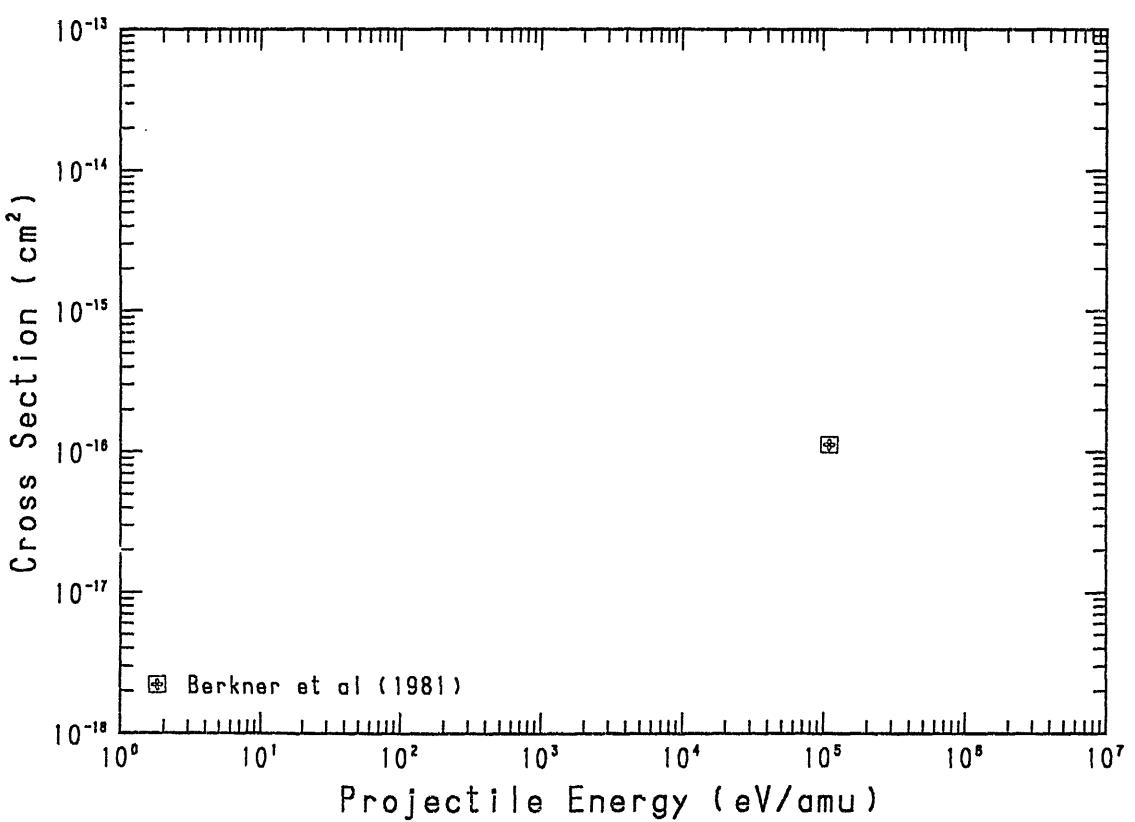


Fig.A17. $\text{Fe}^{4+} + \text{H}_2 \rightarrow \text{Fe}^{5+}$

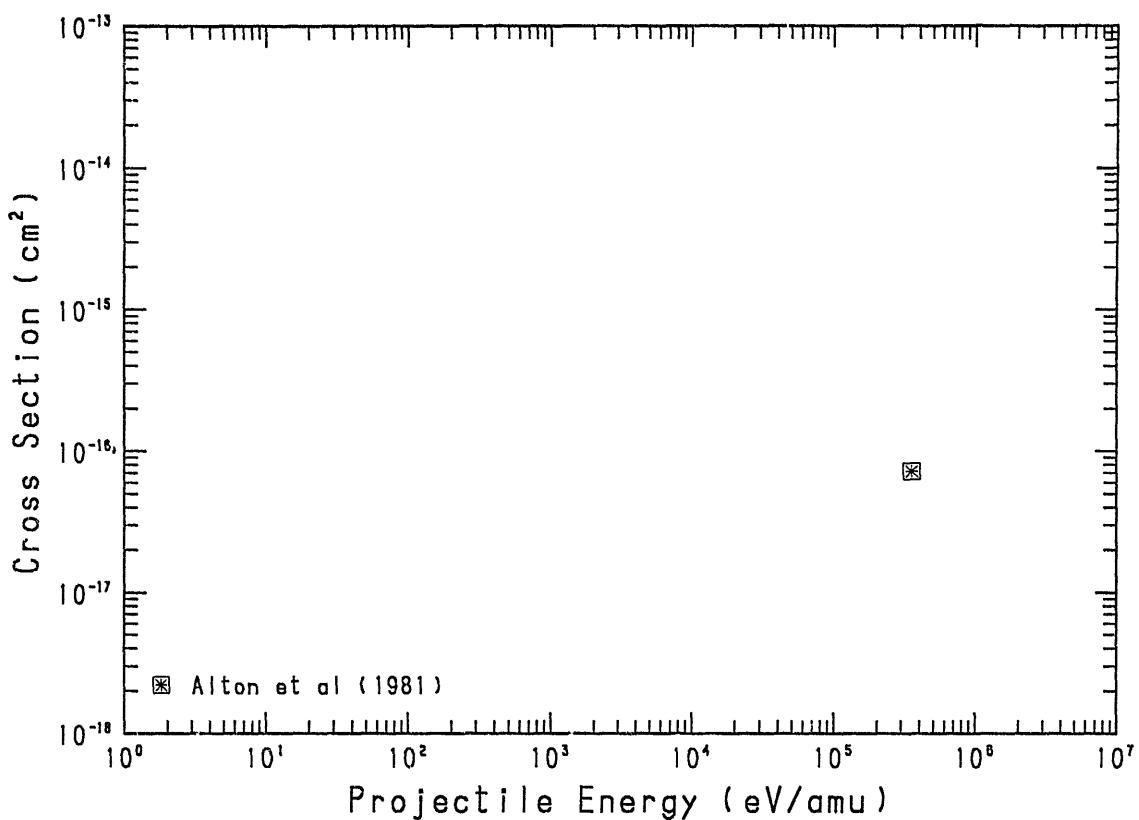


Fig.A18 $\text{Fe}^{4+} + \text{H}_2 \rightarrow \text{Fe}^{6+}$

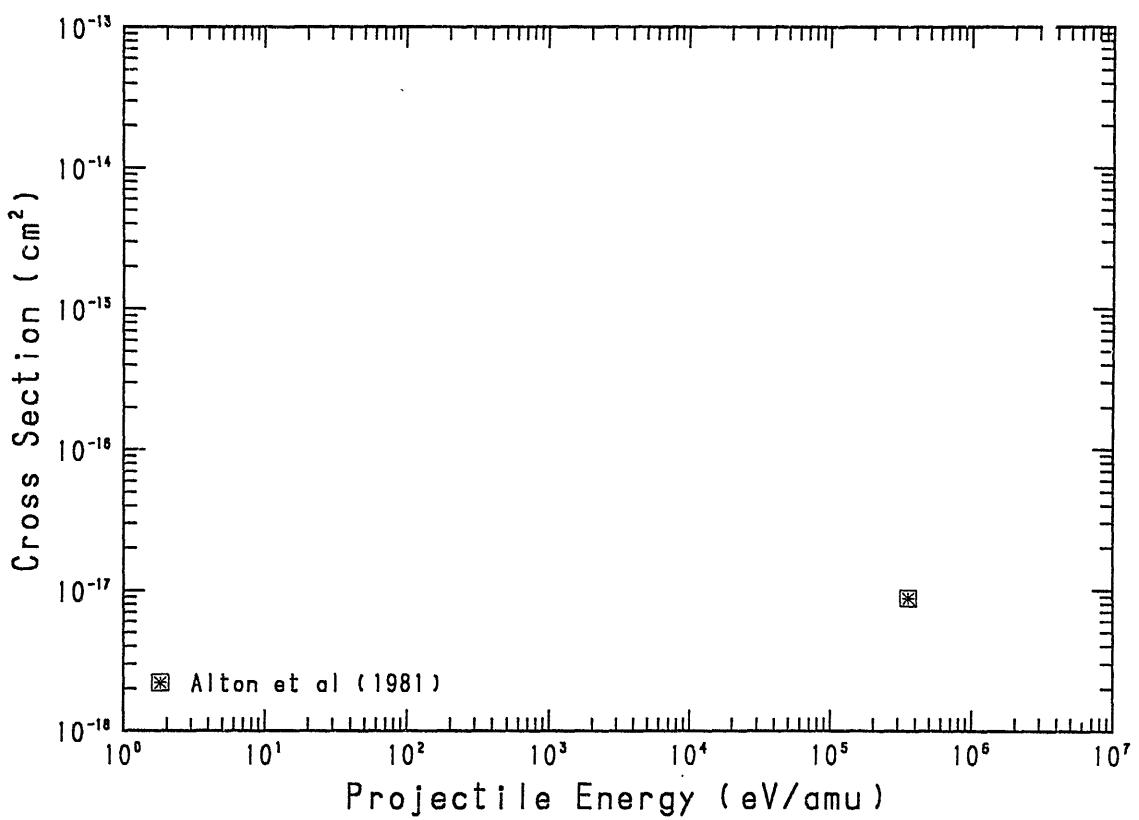


Fig.A19 $\text{Fe}^{4+} + \text{H}_2 \rightarrow \text{Fe}^{7+}$

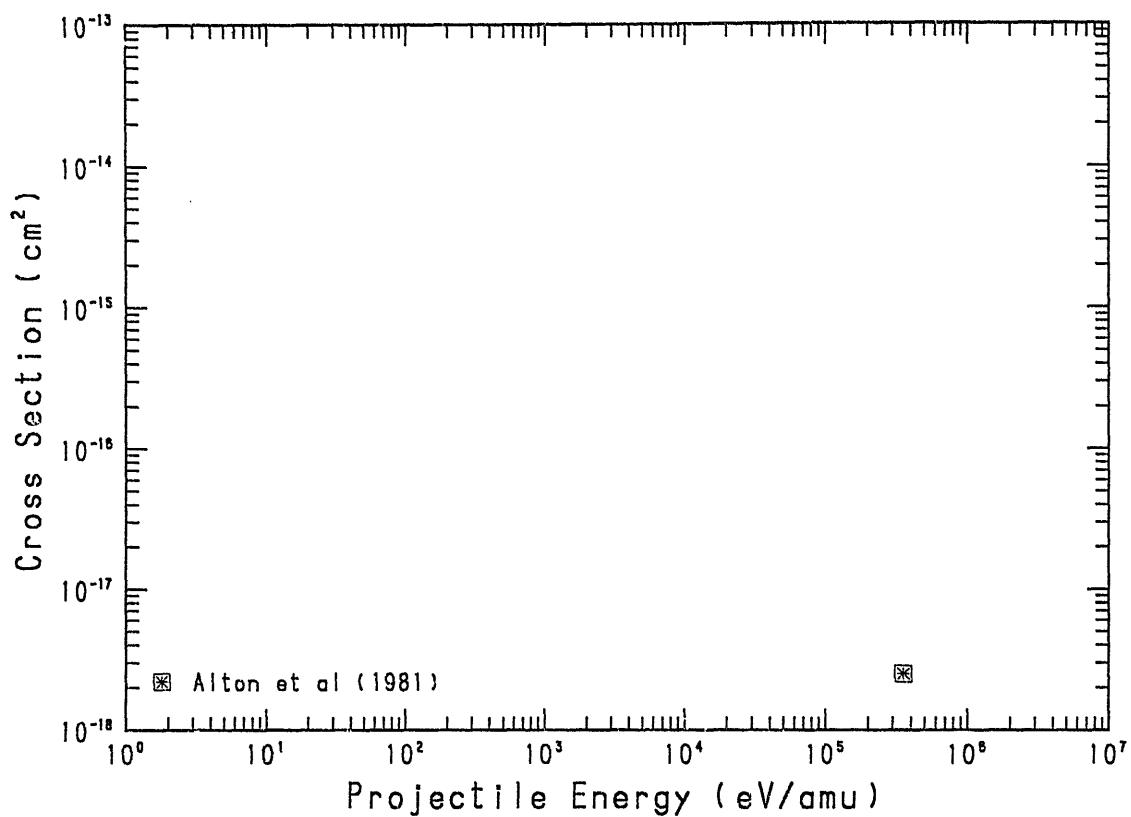


Fig.A20 $\text{Fe}^{9+} + \text{H}_2 \rightarrow \text{Fe}^{10+}$

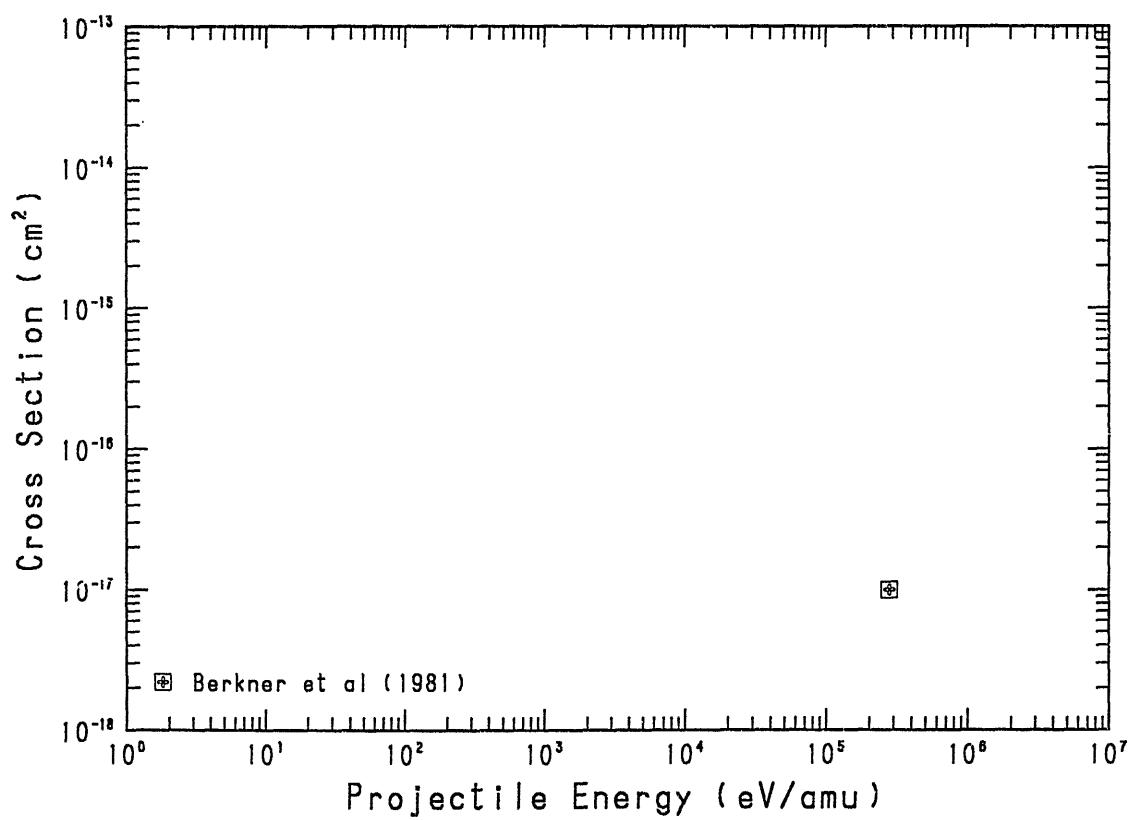


Fig.A21. $\text{Fe}^{12+} + \text{H}_2 \rightarrow \text{Fe}^{13+}$

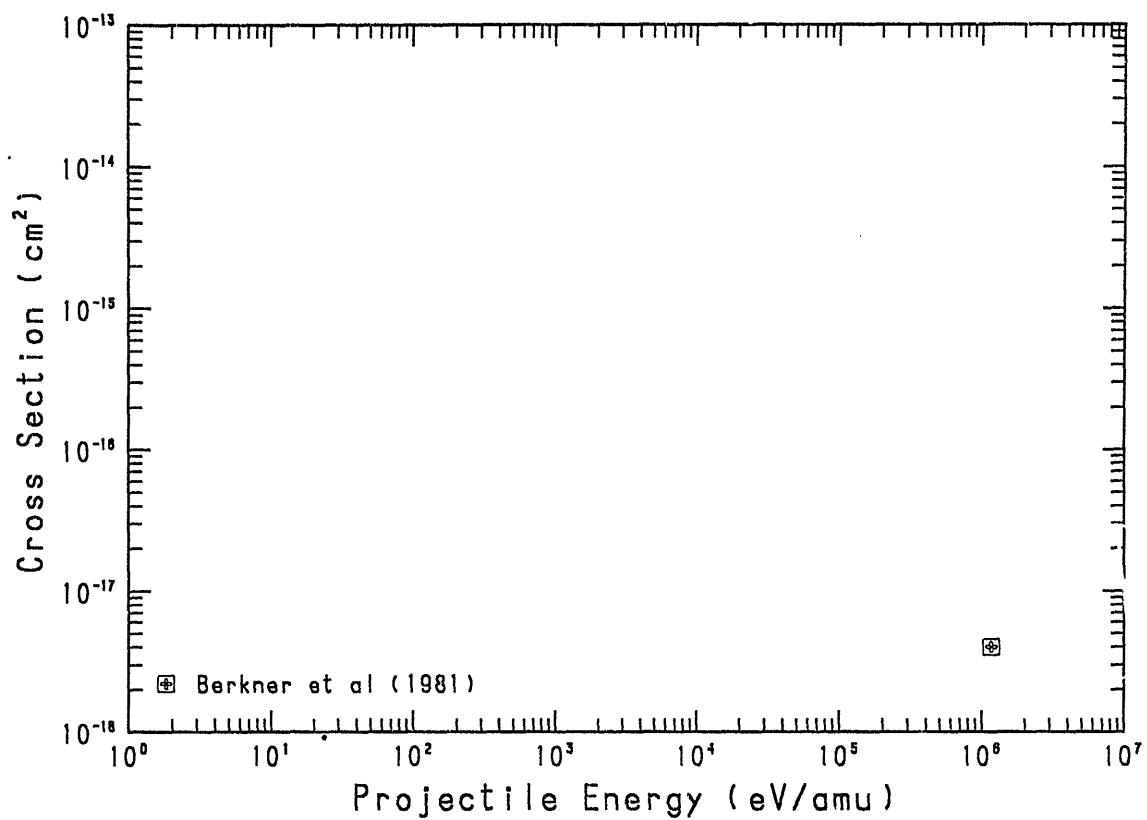


Fig.A22 $\text{Fe}^{14+} + \text{H}_2 \rightarrow \text{Fe}^{15+}$

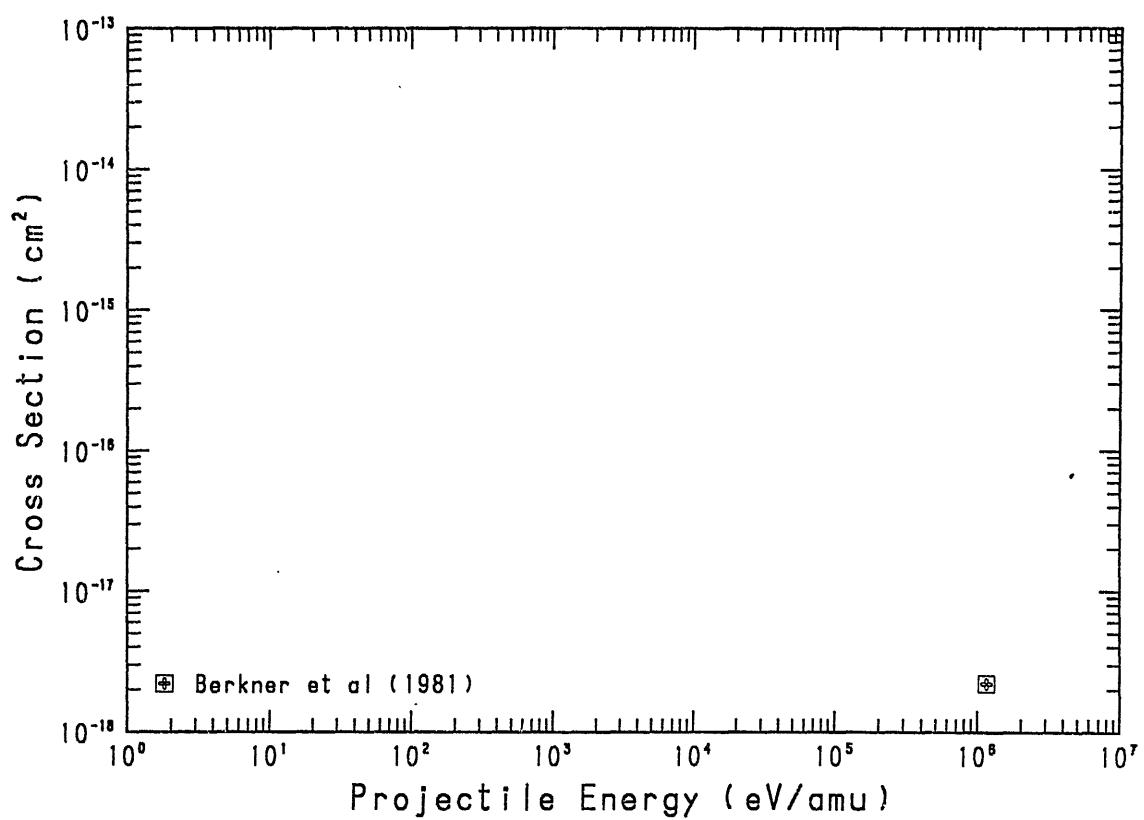


Fig.A23 $\text{Fe}^{14+} + \text{H}_2 \rightarrow \text{Fe}^{16+}$

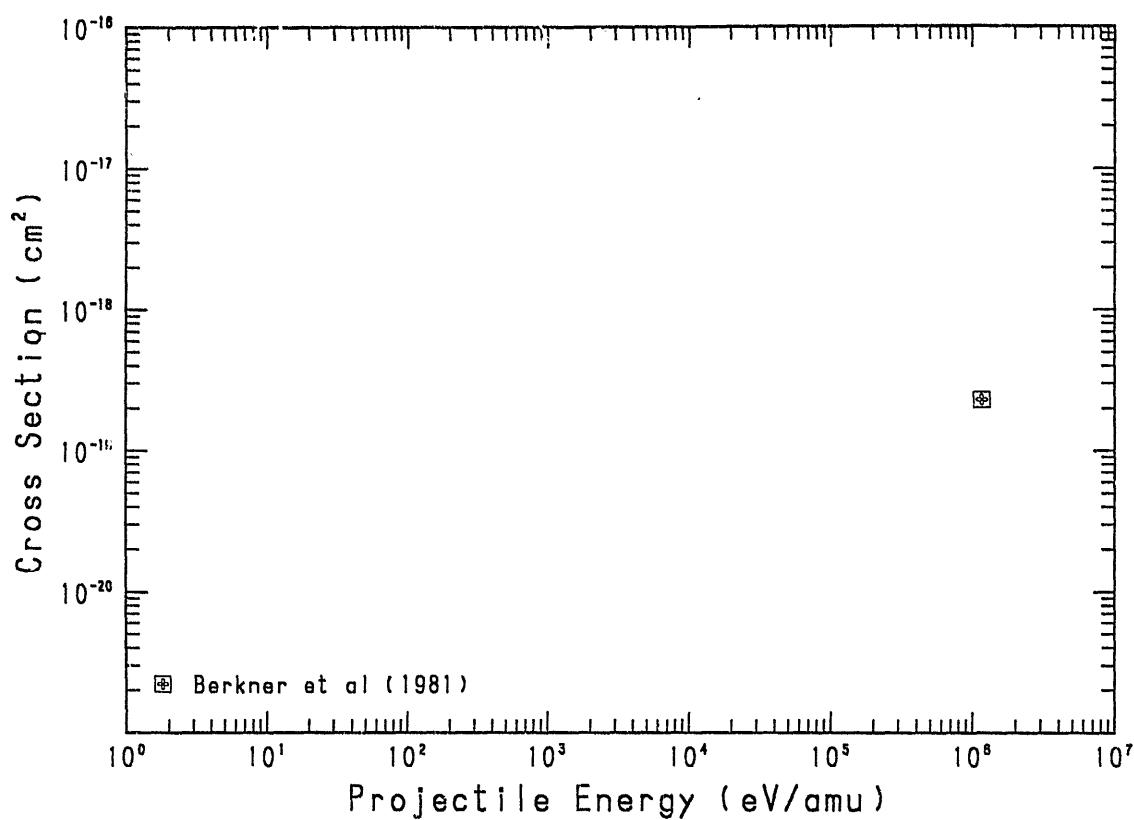


Fig.A24 $\text{Fe}^{16+} + \text{H}_2 \rightarrow \text{Fe}^{17+}$

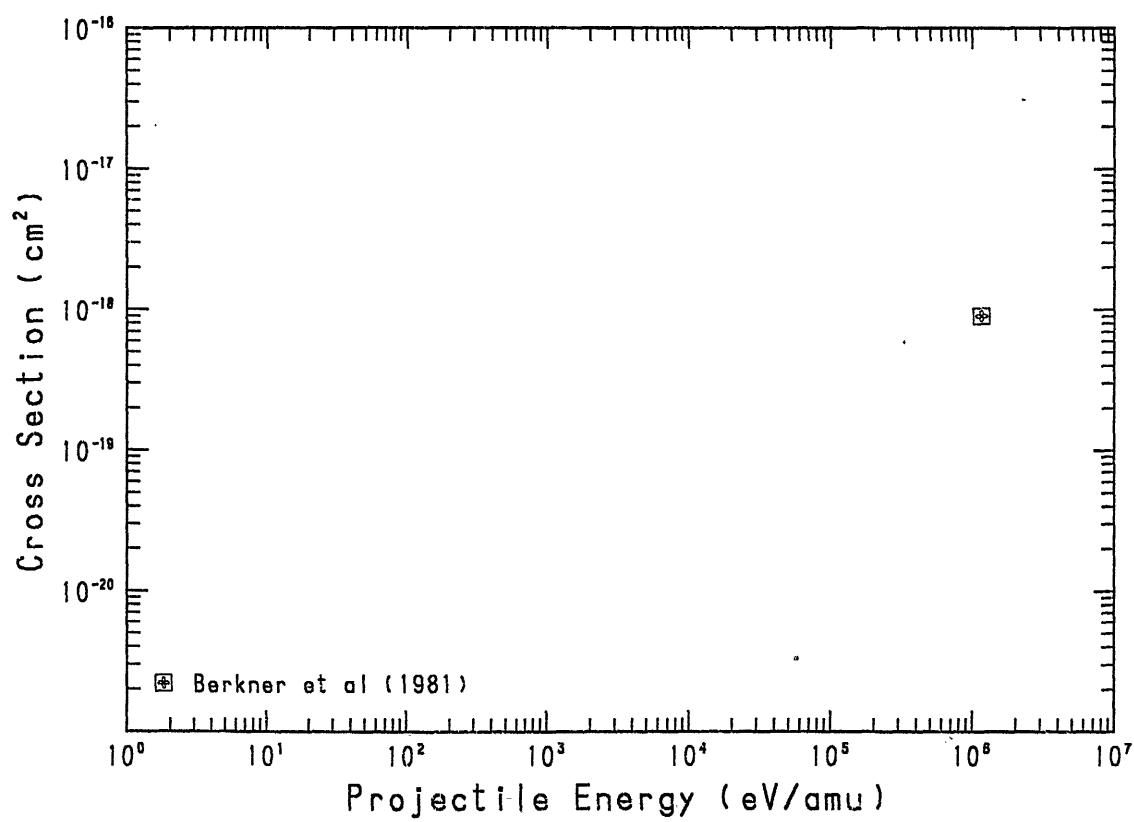


Fig.A25. $\text{Fe}^{16+} + \text{H}_2 \rightarrow \text{Fe}^{18+}$

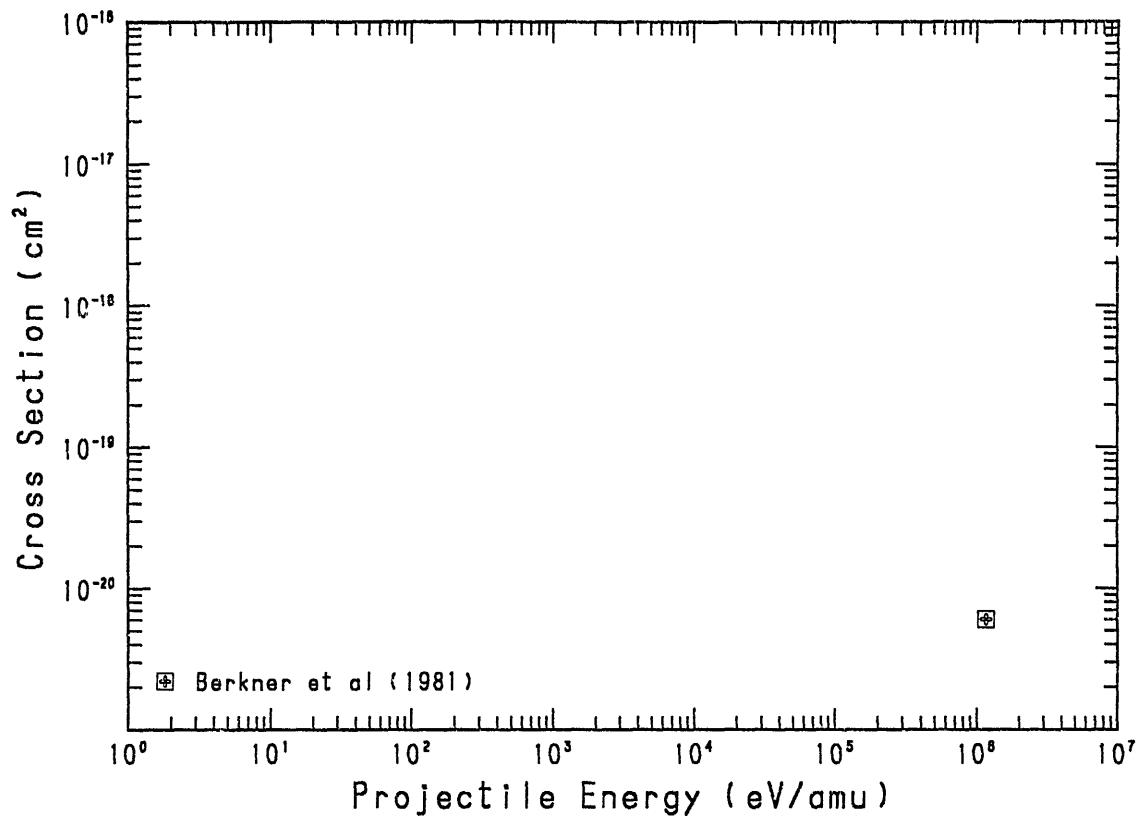


Fig.A26 $\text{Fe}^{18+} + \text{H}_2 \rightarrow \text{Fe}^{18+}$

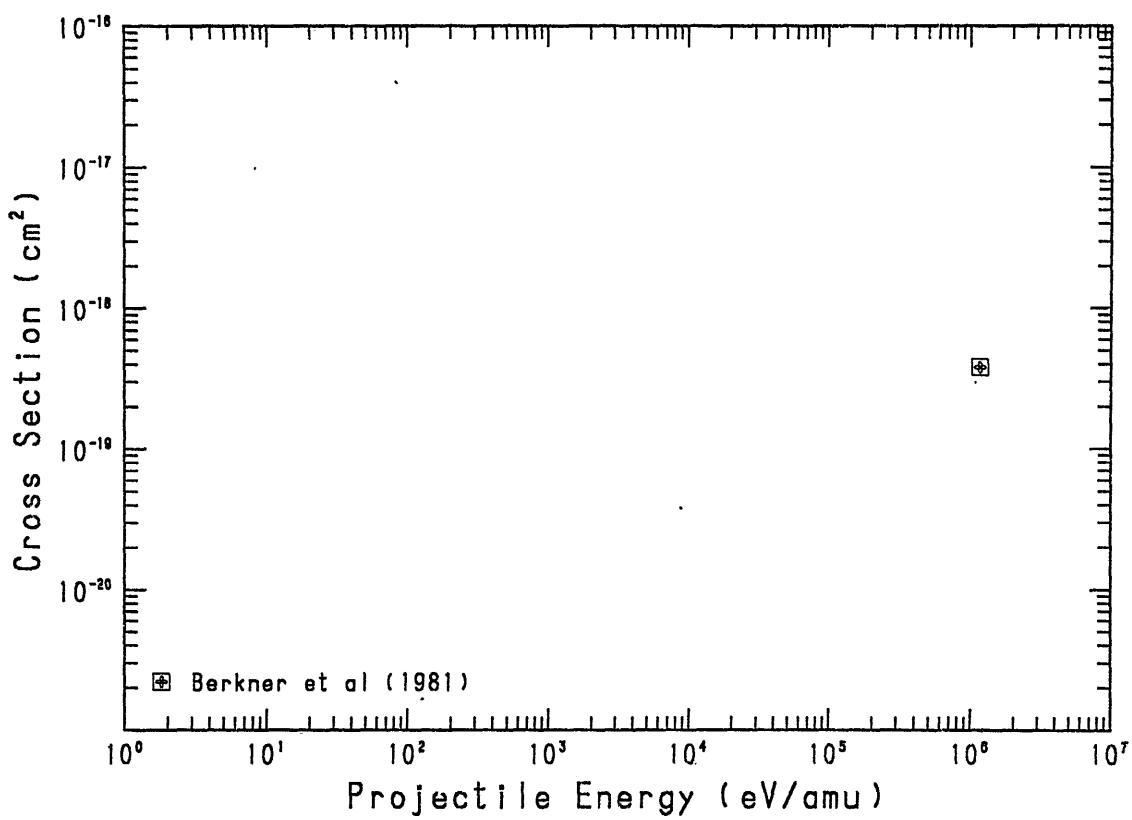


Fig.A27 $\text{Fe}^{20+} + \text{H}_2 \rightarrow \text{Fe}^{21+}$

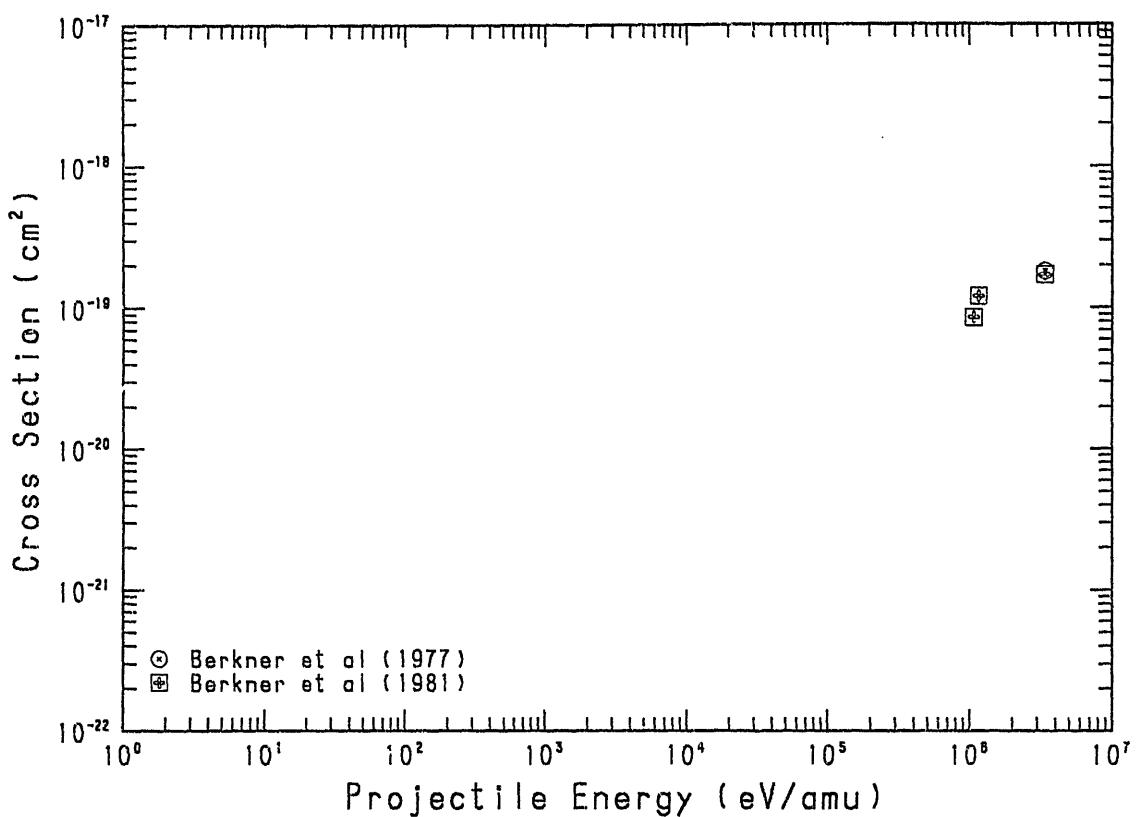


Fig.A28 $\text{Fe}^{21+} + \text{H}_2 \rightarrow \text{Fe}^{22+}$

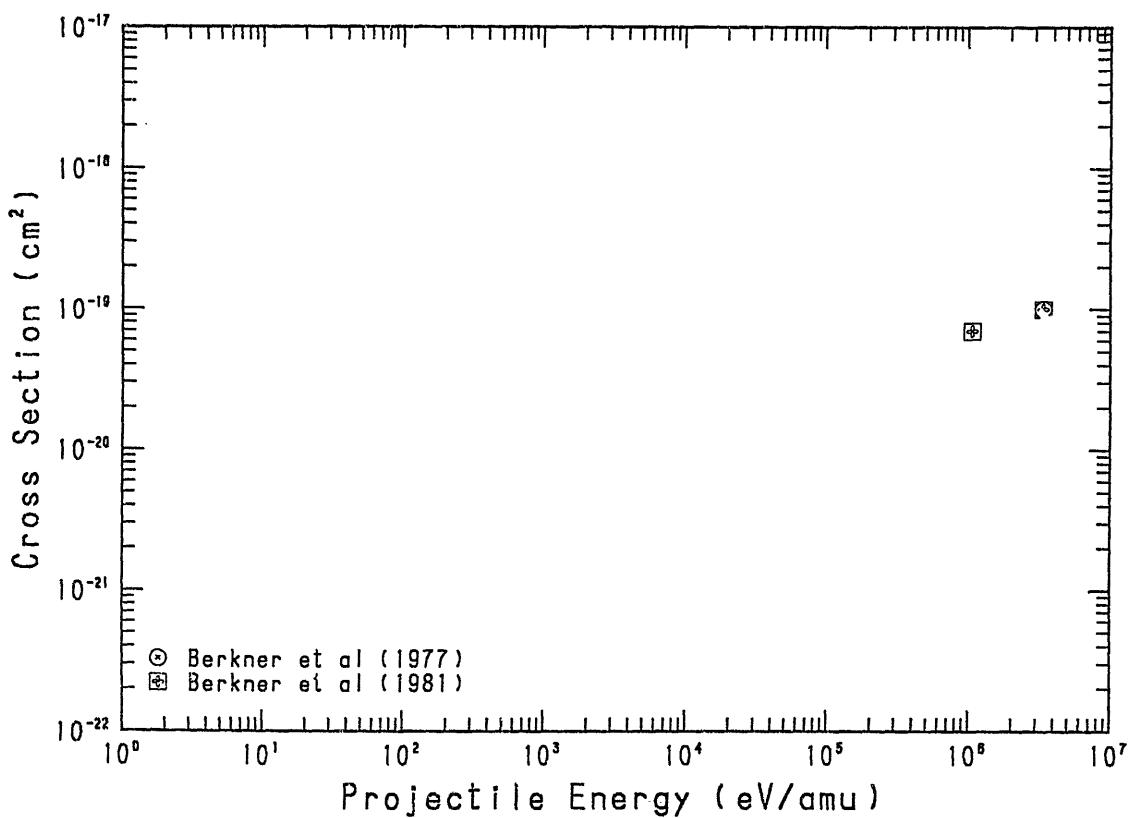


Fig.A29 $\text{Fe}^{21+} + \text{H}_2 \rightarrow \text{Fe}^{23+}$

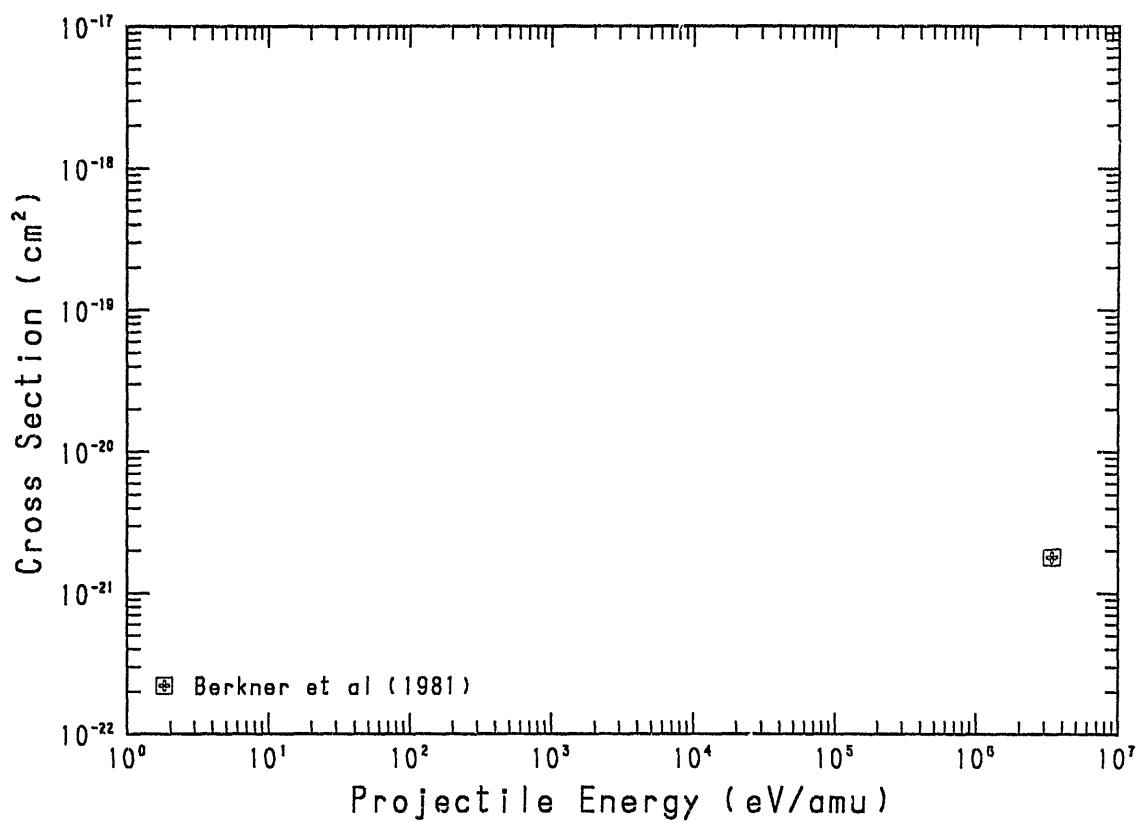


Fig.A30 $\text{Fe}^{22+} + \text{H}_2 \rightarrow \text{Fe}^{23+}$

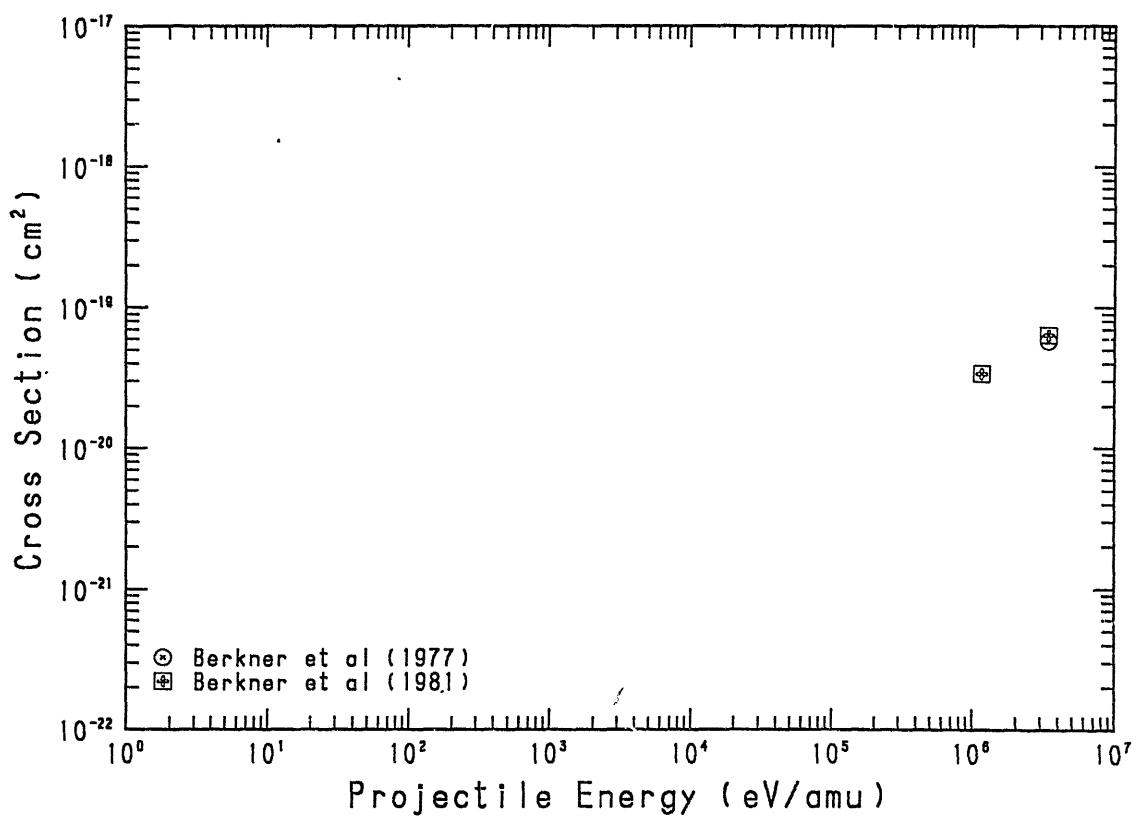


Fig.A31 $\text{Fe}^{22+} + \text{H}_2 \rightarrow \text{Fe}^{24+}$

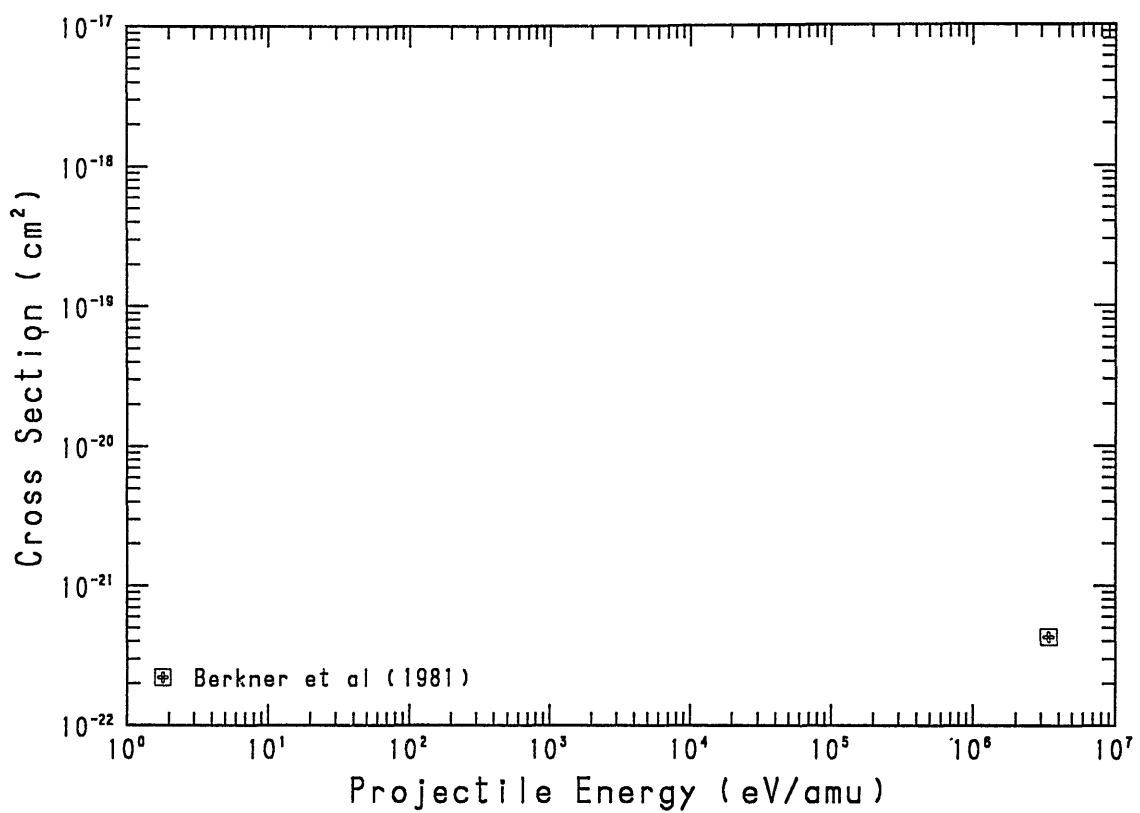


Fig.A32 $\text{Fe}^{23+} + \text{H}_2 \rightarrow \text{Fe}^{24+}$

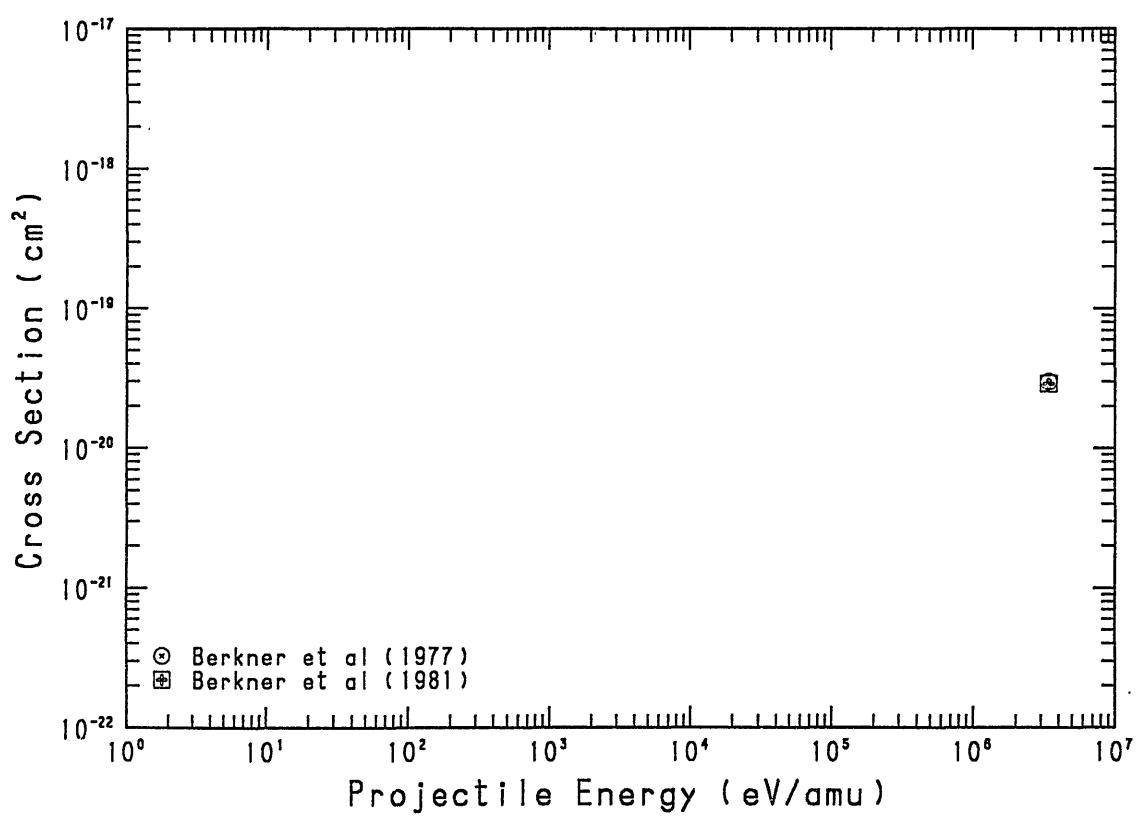


Fig.A33 $\text{Fe}^{24+} + \text{H}_2 \rightarrow \text{Fe}^{25+}$

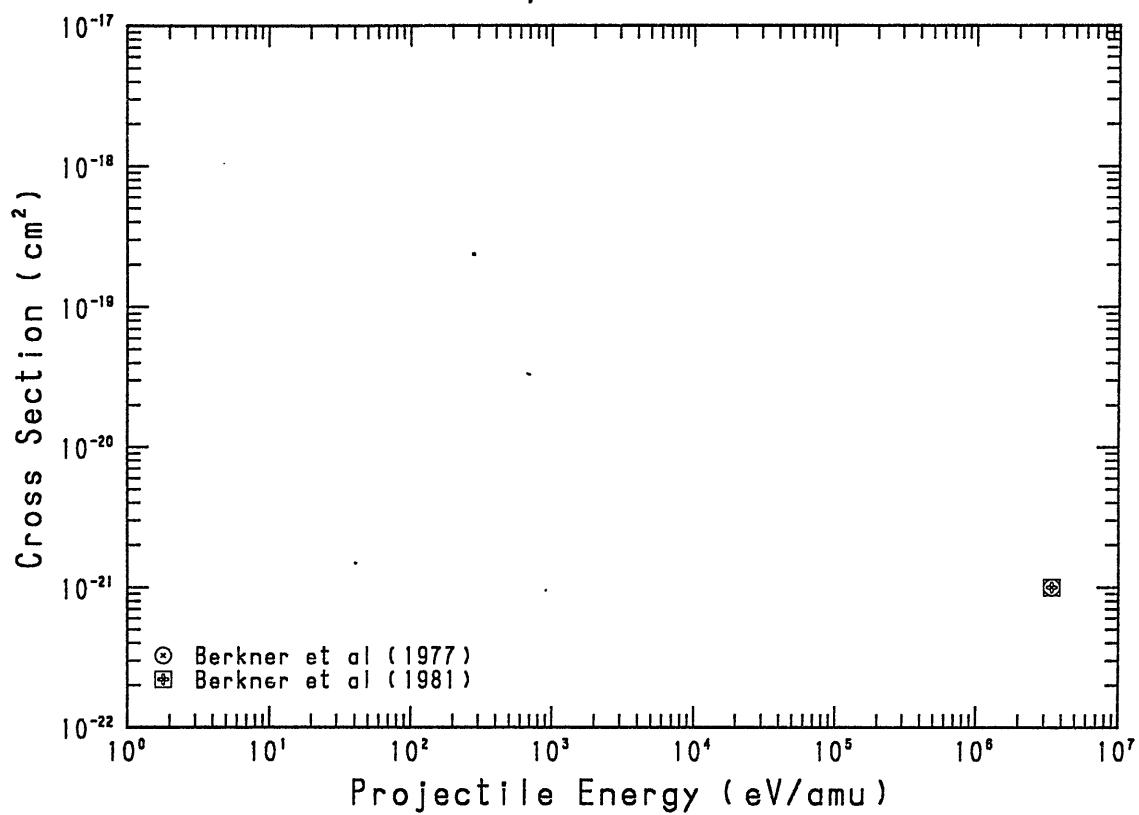


Fig.A34 $\text{Fe}^{25+} + \text{H}_2 \rightarrow \text{Fe}^{26+}$

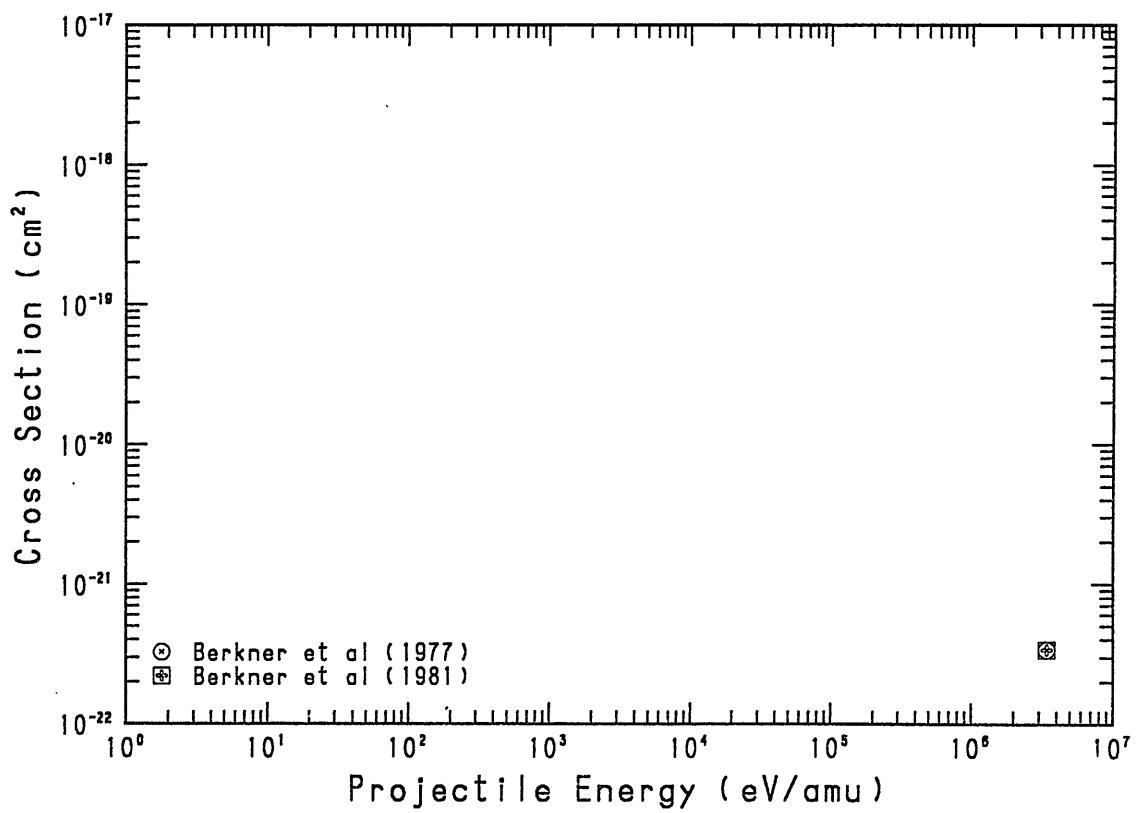


Fig.A35 $\text{Br}^{3+} + \text{H}_2 \rightarrow \text{Br}^{4+}$

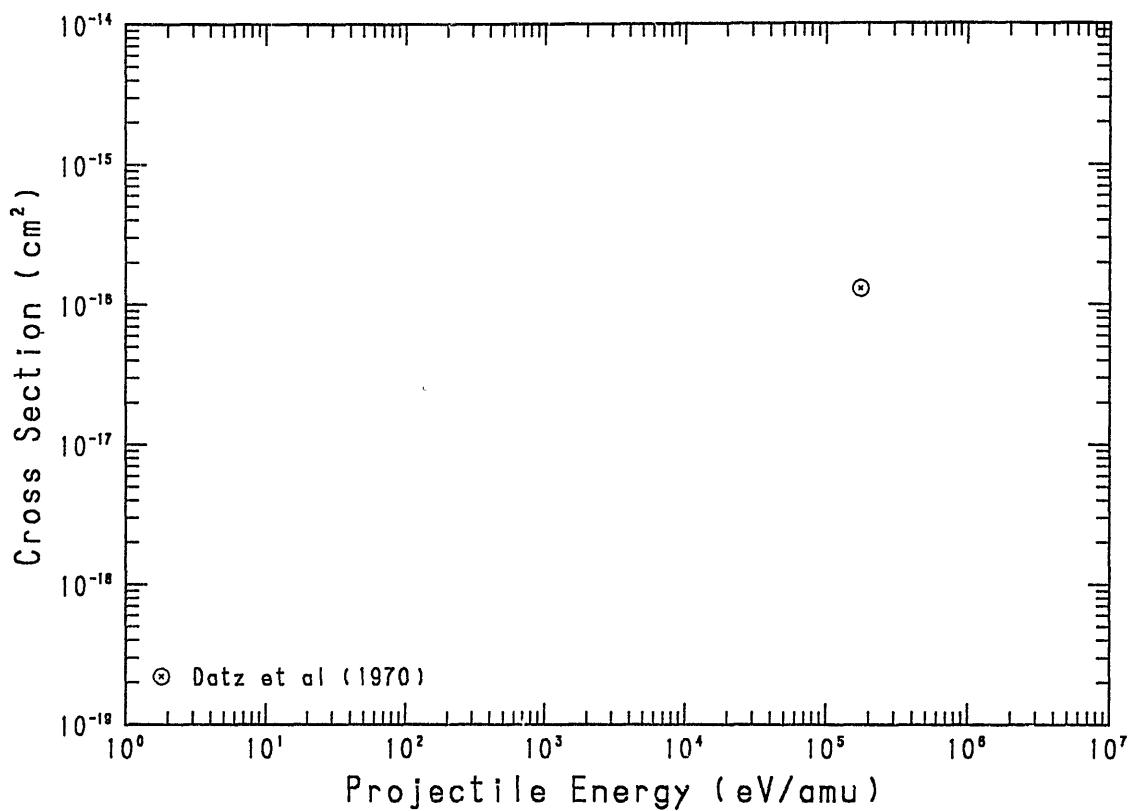


Fig.A36 $\text{Br}^{4+} + \text{H}_2 \rightarrow \text{Br}^{5+}$

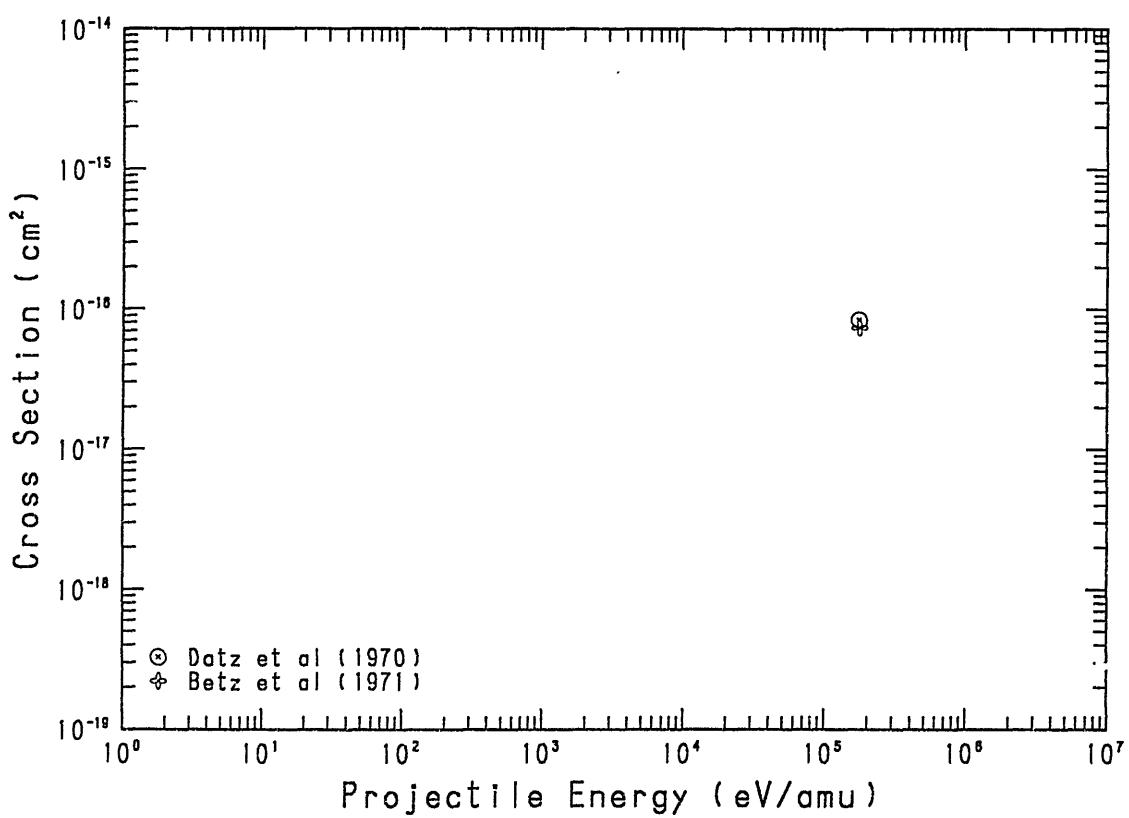


Fig.A37. $\text{Br}^{4+} + \text{H}_2 \rightarrow \text{Br}^{6+}$

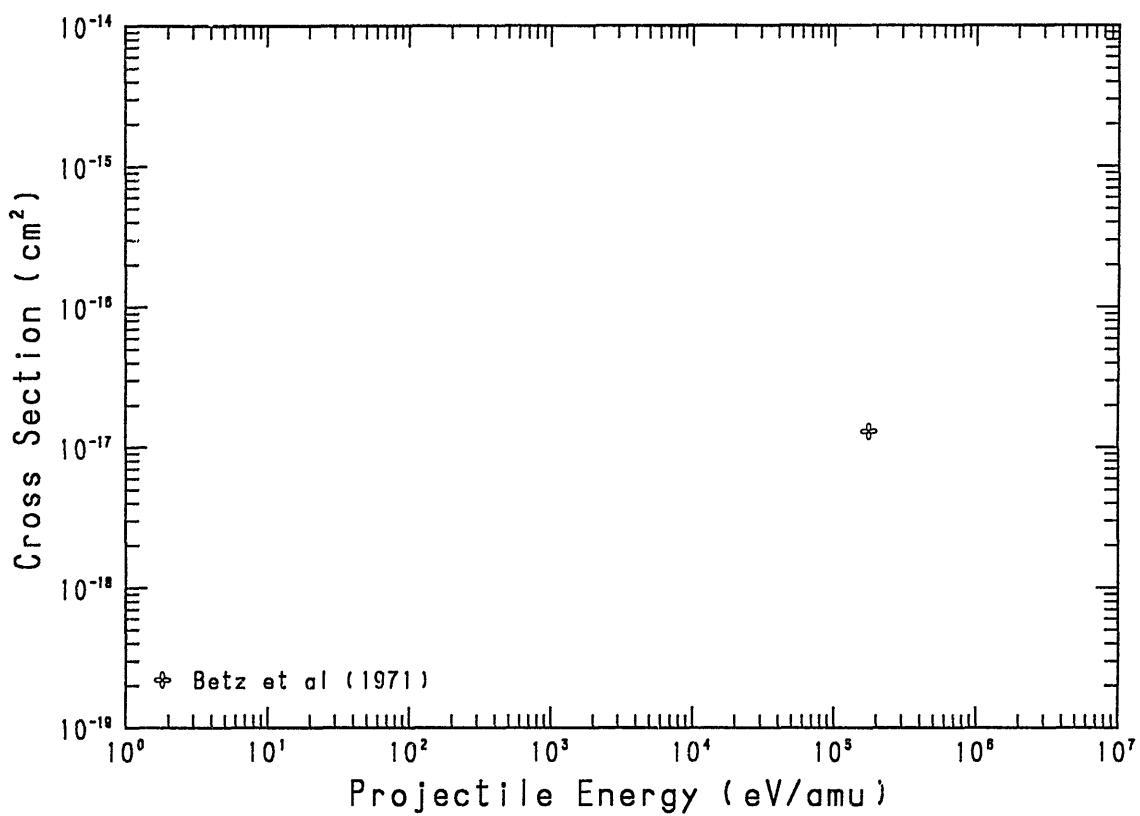


Fig.A38 $\text{Br}^{4+} + \text{H}_2 \rightarrow \text{Br}^{7+}$

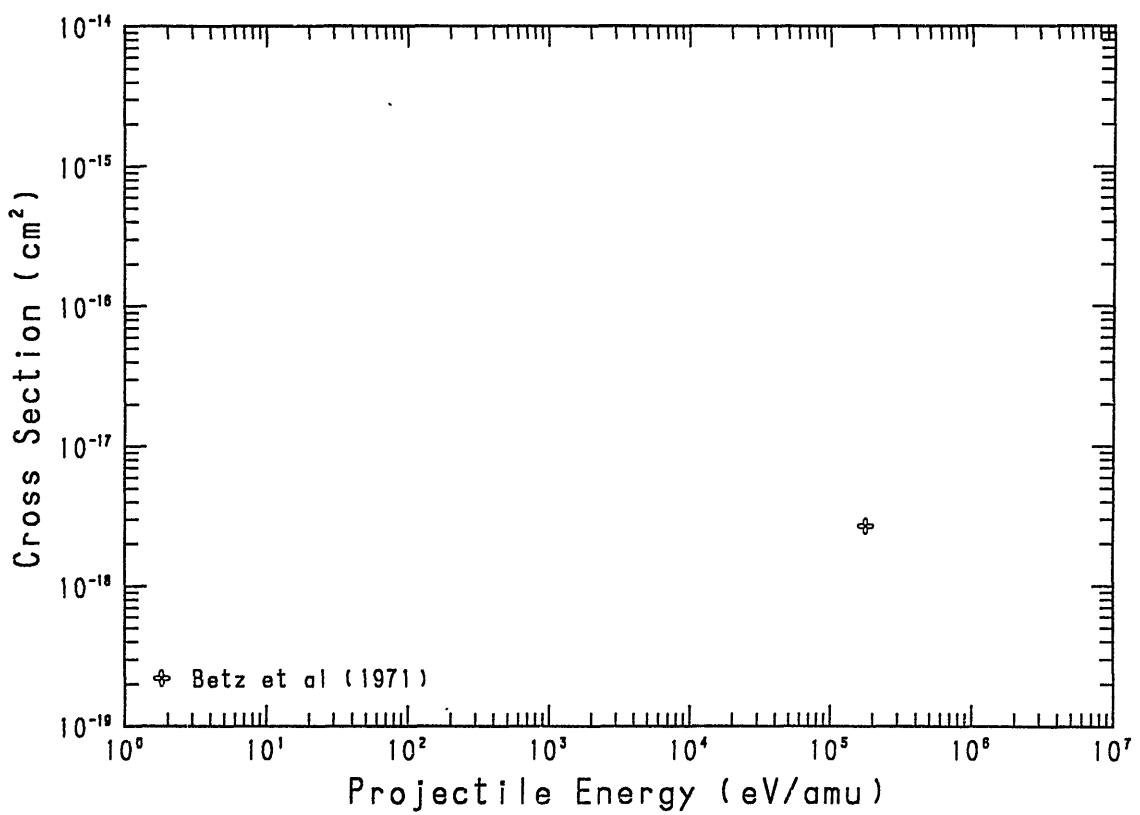


Fig.A39 $\text{Br}^{4+} + \text{H}_2 \rightarrow \text{Br}^{8+}$

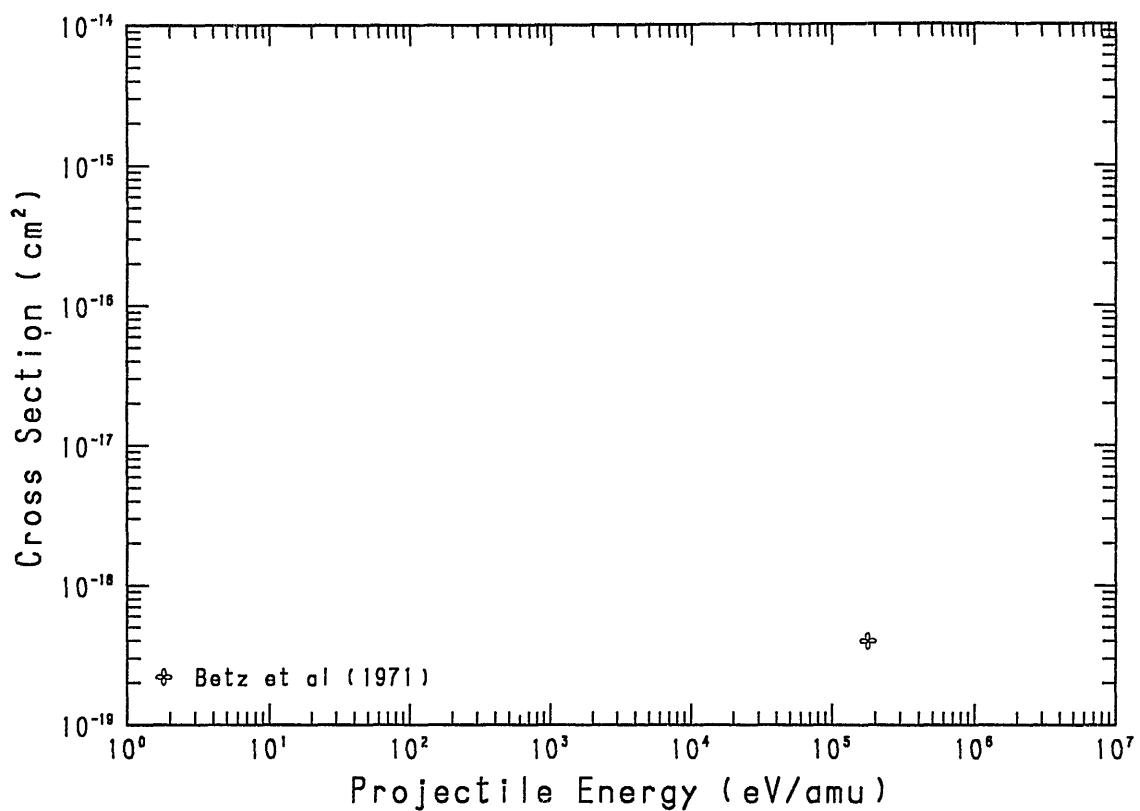


Fig.A40 $\text{Br}^{5+} + \text{H}_2 \rightarrow \text{Br}^{6+}$

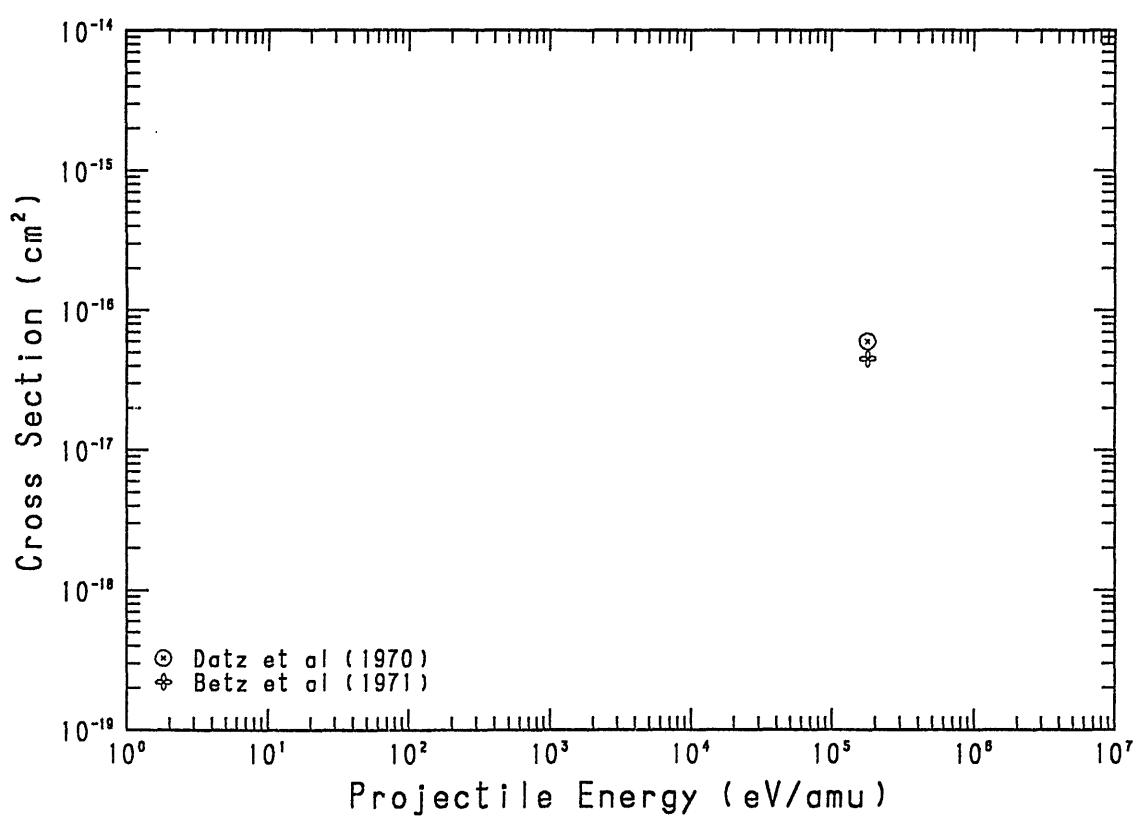


Fig.A41 $\text{Br}^{5+} + \text{H}_2 \rightarrow \text{Br}^{7+}$

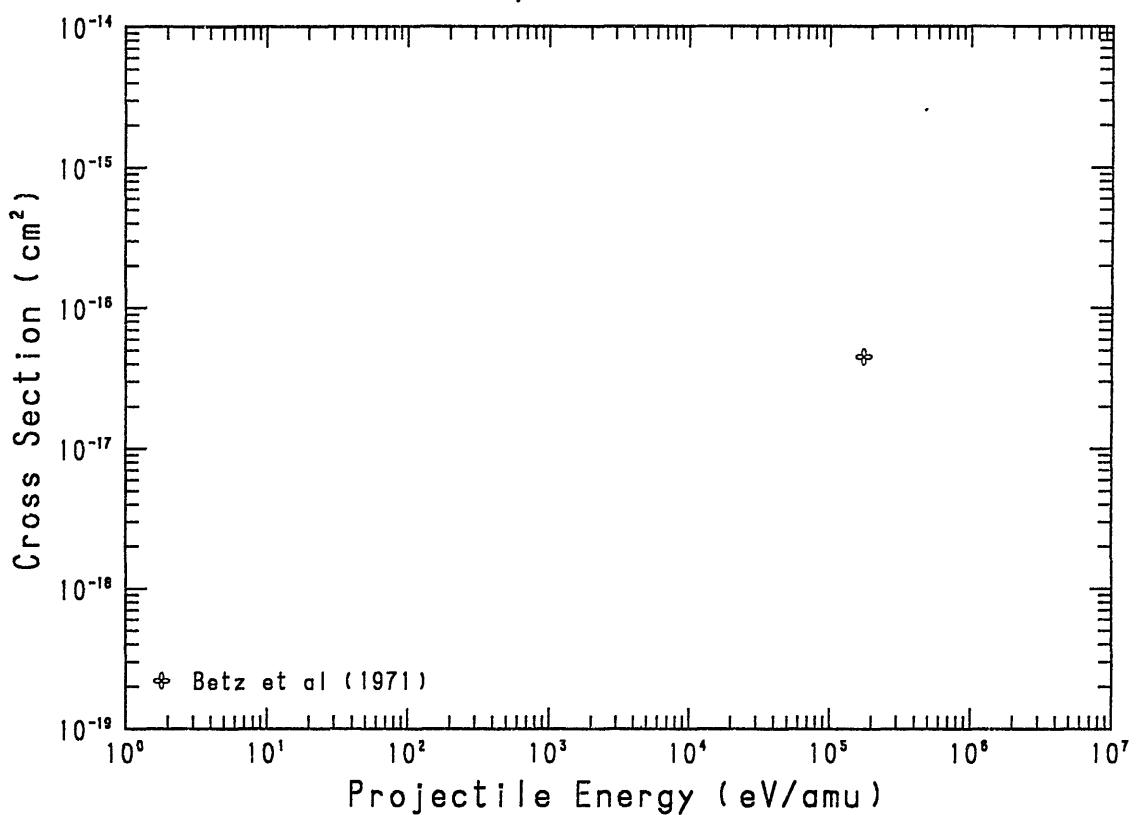


Fig.A42 $\text{Br}^{6+} + \text{H}_2 \rightarrow \text{Br}^{7+}$

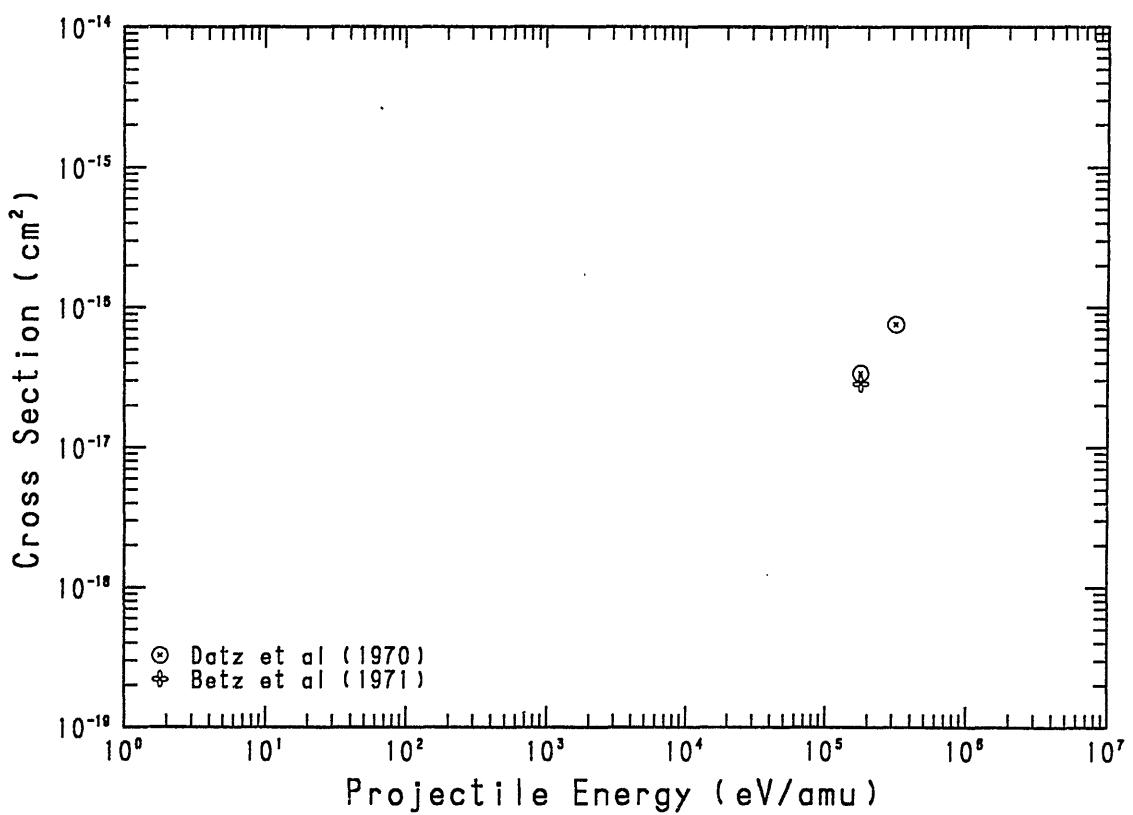


Fig.A43 $\text{Br}^{6+} + \text{H}_2 \rightarrow \text{Br}^{8+}$

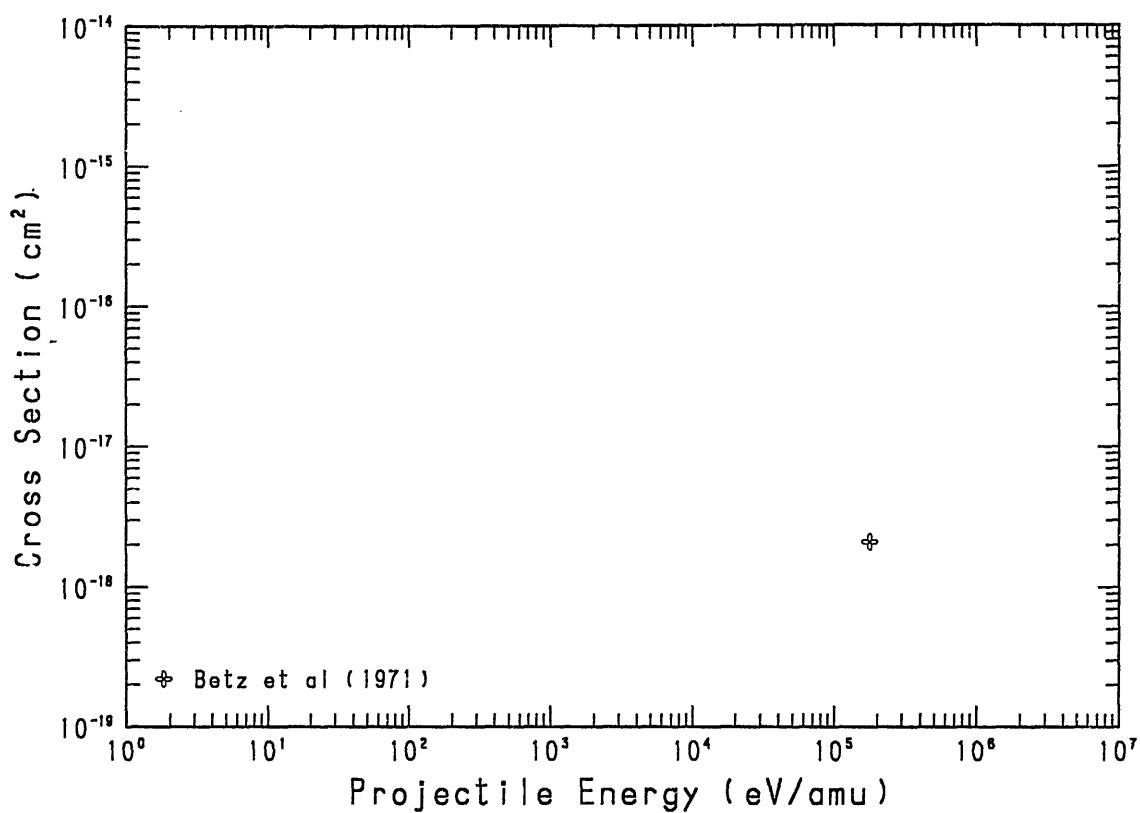


Fig.A44 $\text{Br}^{7+} + \text{H}_2 \rightarrow \text{Br}^{8+}$

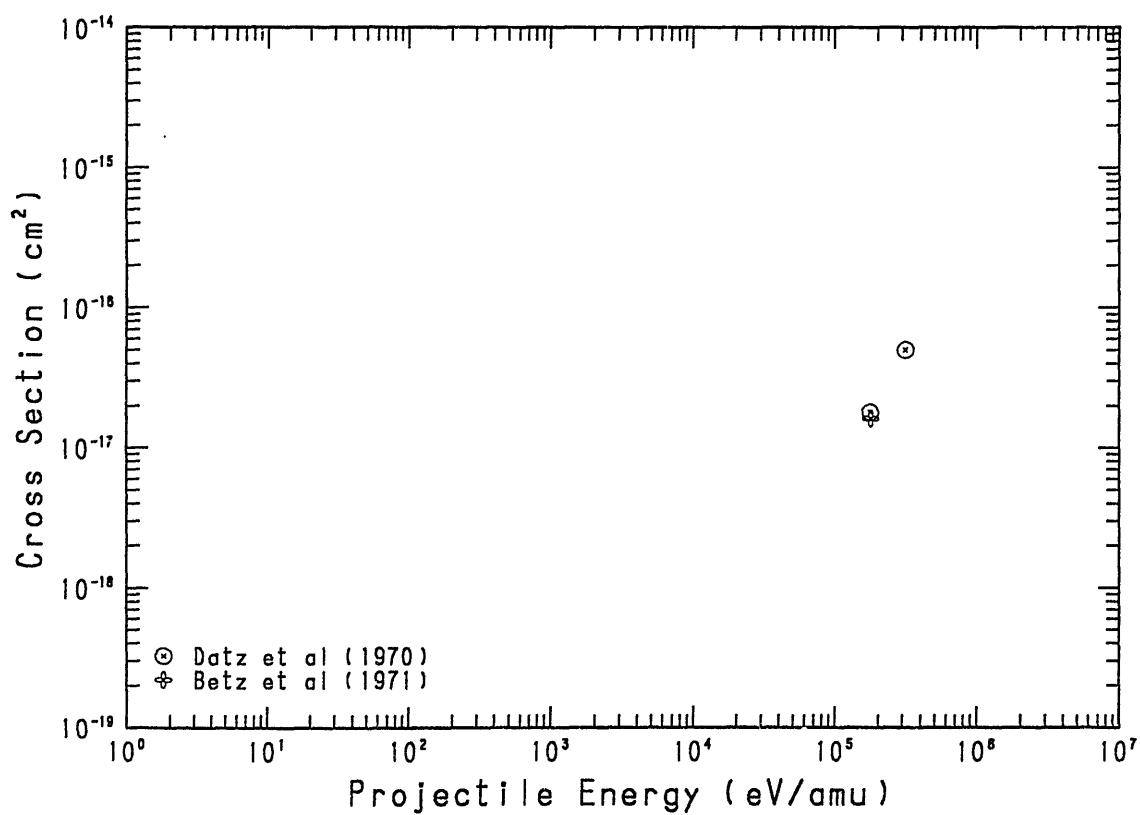


Fig.A45, $\text{Br}^{7+} + \text{H}_2 \rightarrow \text{Br}^{8+}$

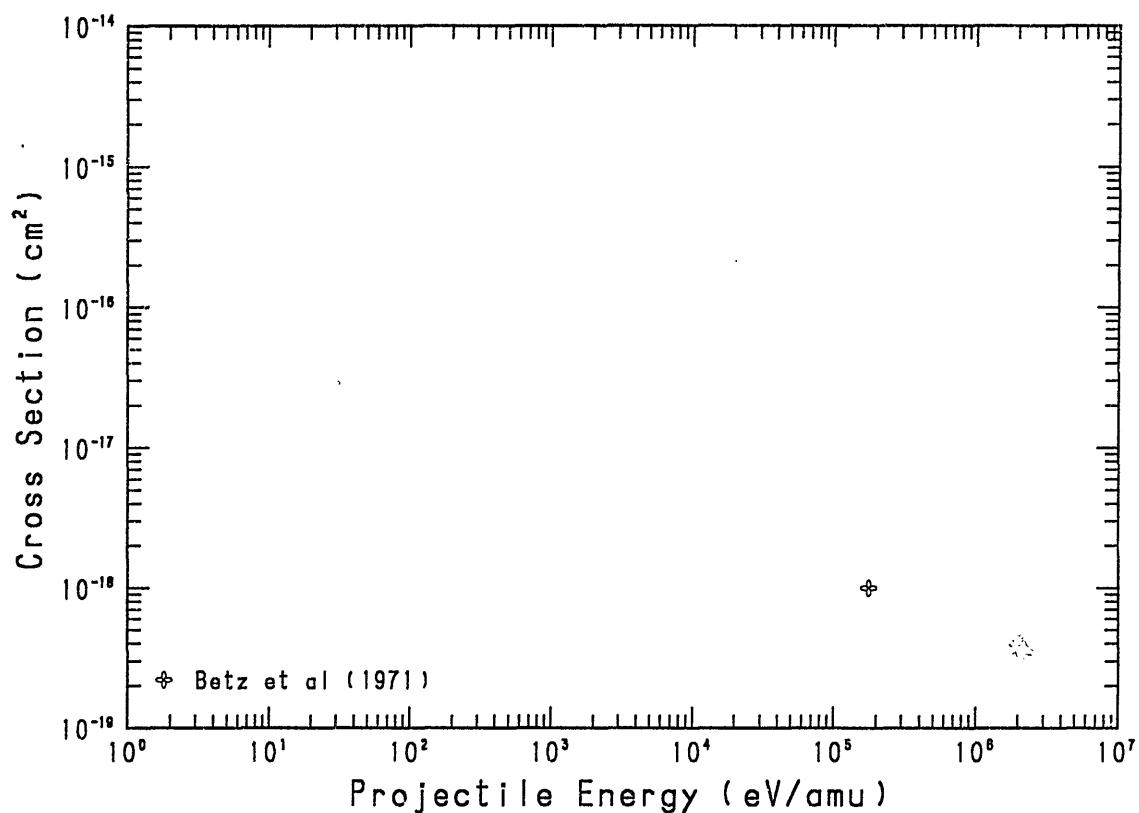


Fig.A46 $\text{Br}^{8+} + \text{H}_2 \rightarrow \text{Br}^{9+}$

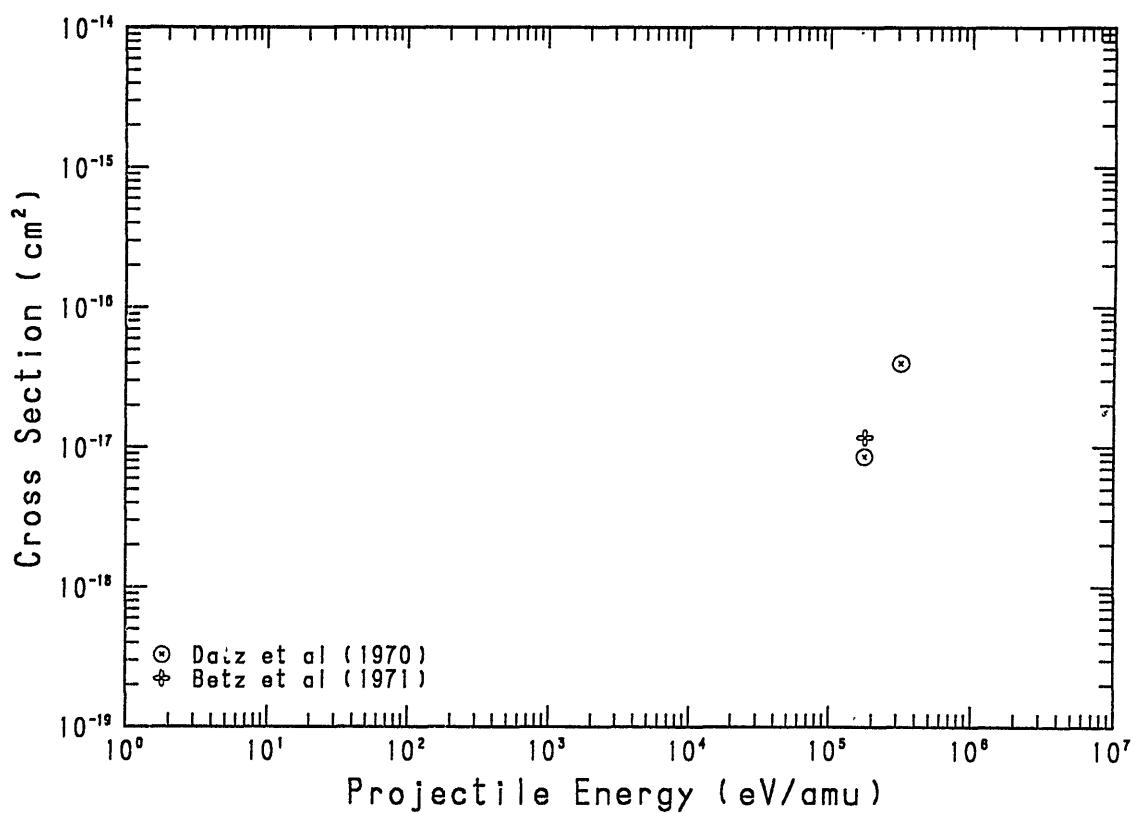


Fig.A47 $\text{Br}^{8+} + \text{H}_2 \rightarrow \text{Br}^{10+}$

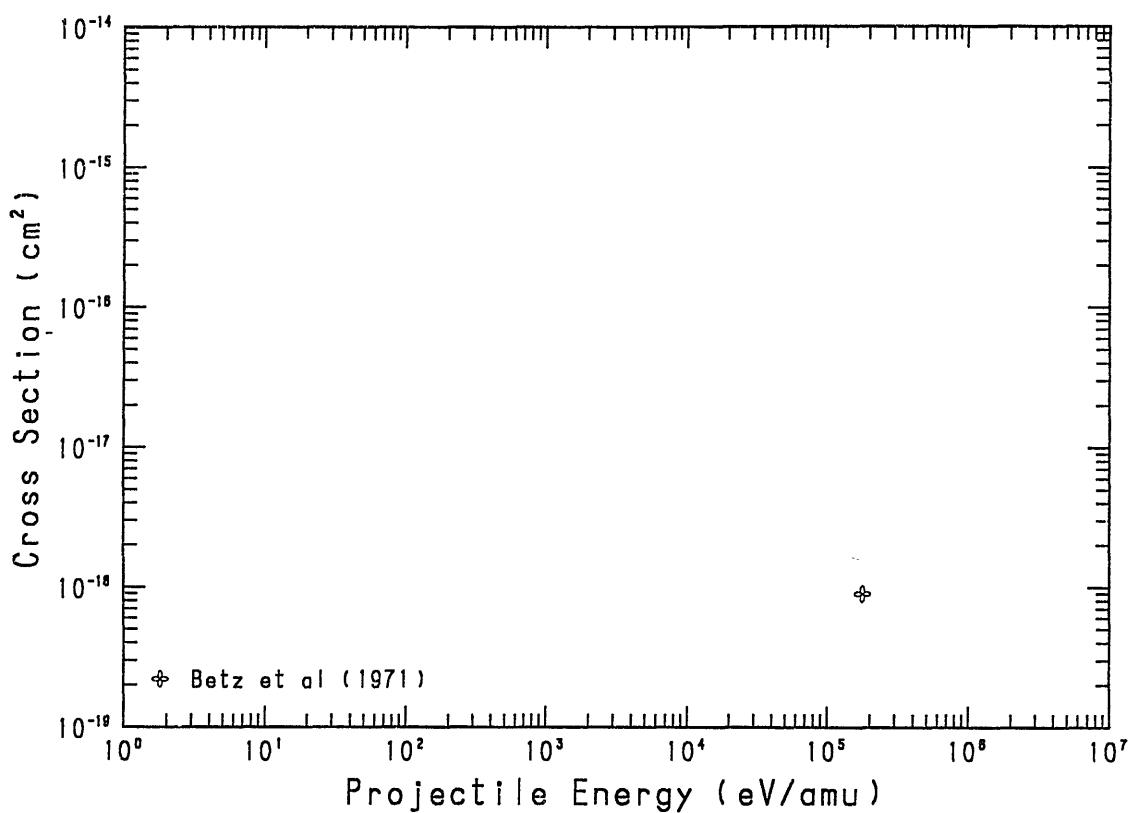


Fig.A48 $\text{Br}^{8+} + \text{H}_2 \rightarrow \text{Br}^{10+}$

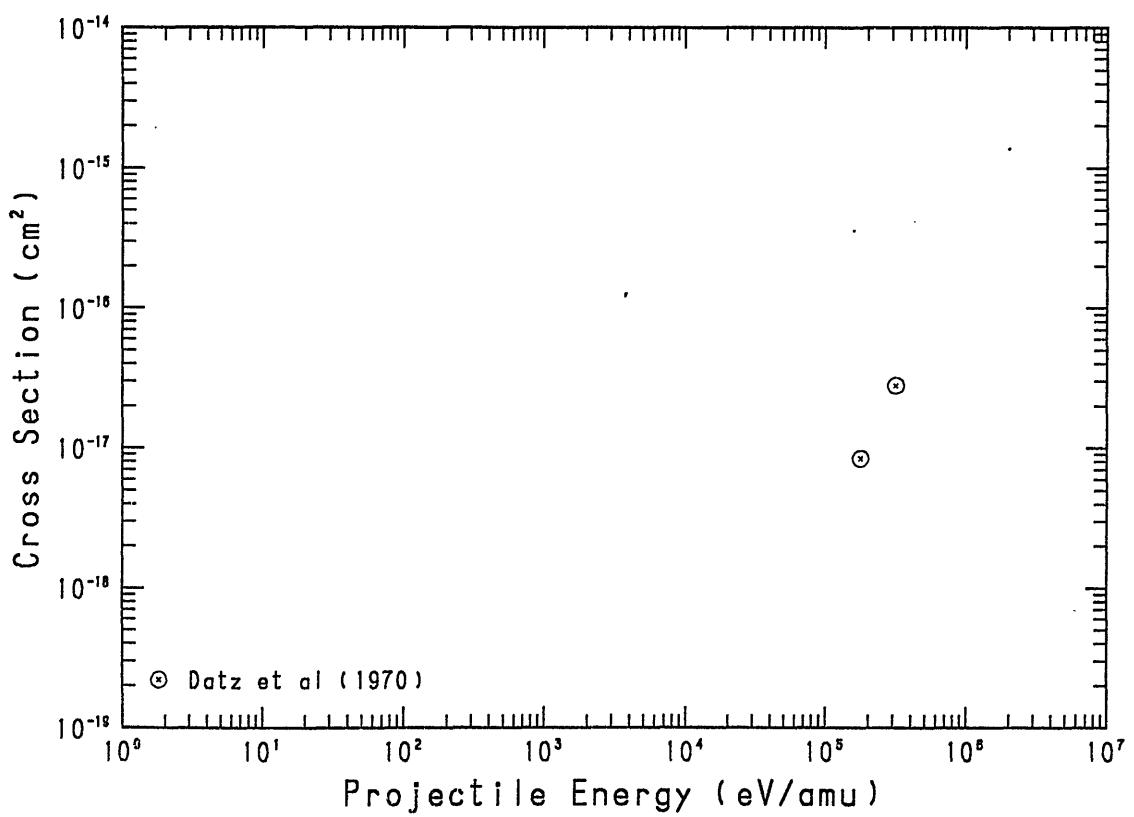


Fig.A49, $\text{Br}^{10+} + \text{H}_2 \rightarrow \text{Br}^{11+}$

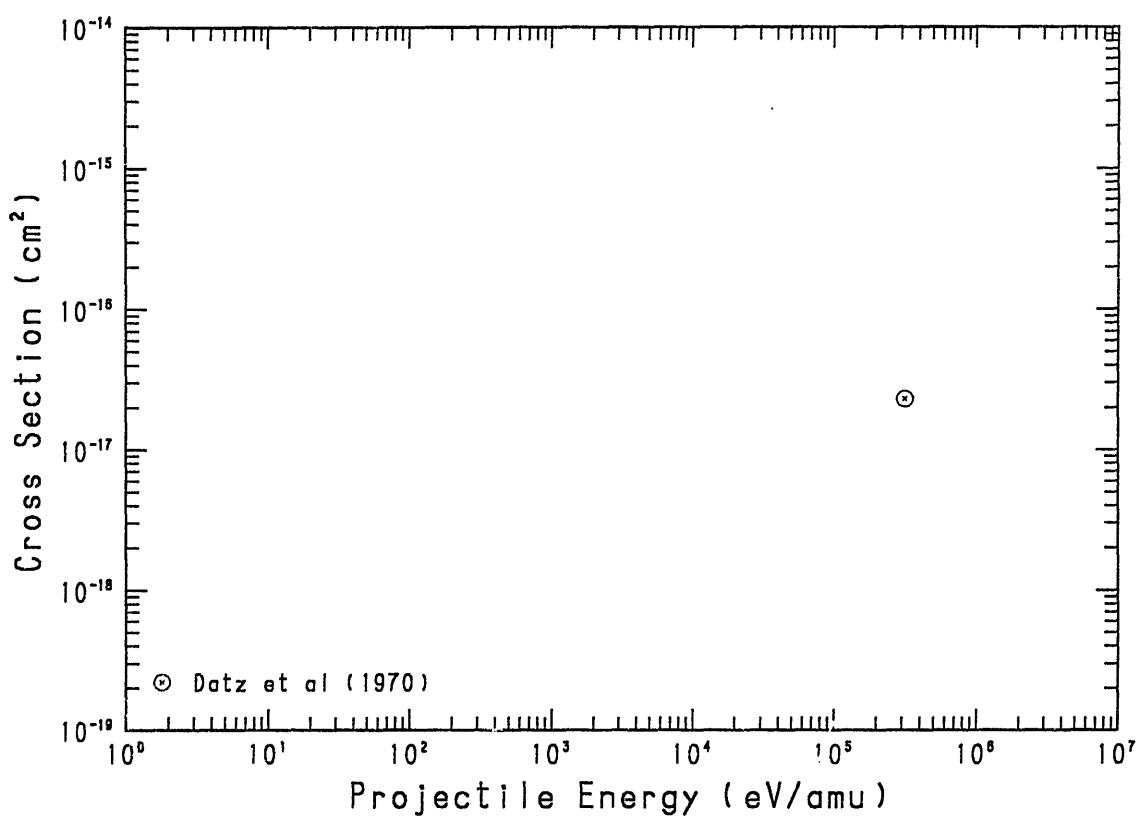


Fig.A50 $\text{Br}^{11+} + \text{H}_2 \rightarrow \text{Br}^{12+}$

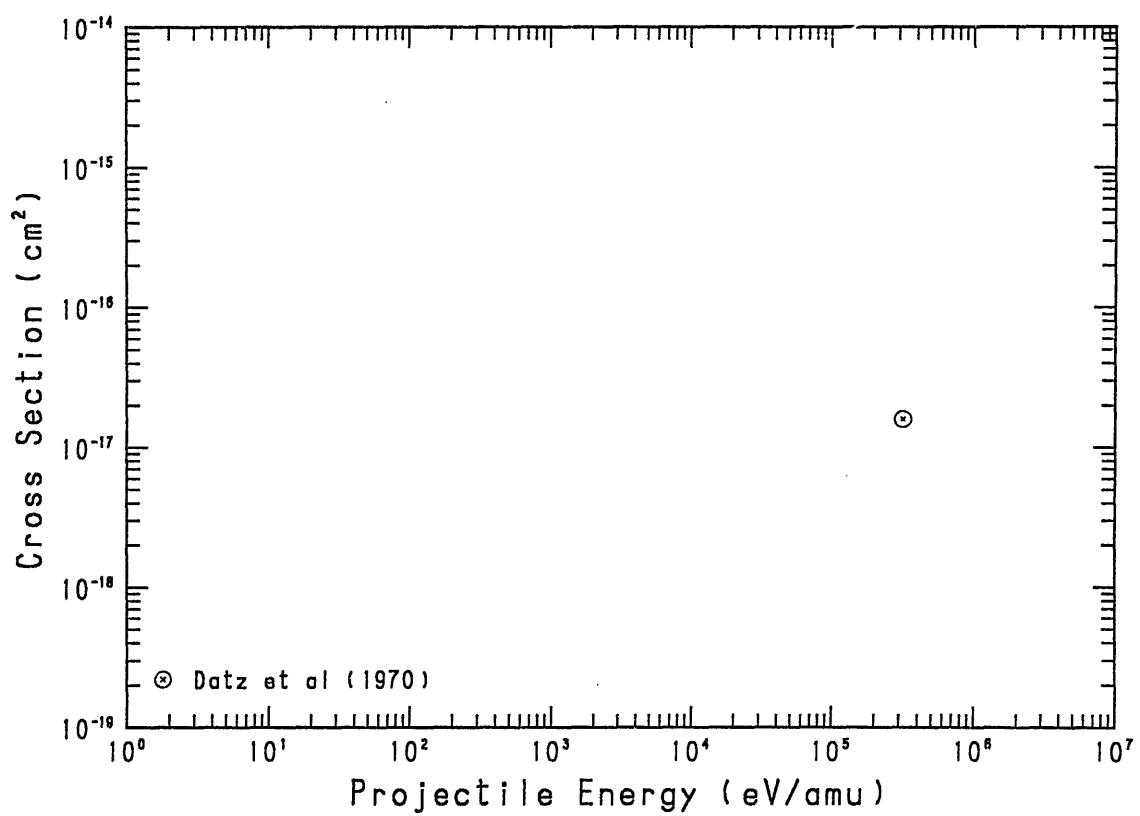


Fig.A51 $I^{2+} + H_2 \rightarrow I^{3+}$

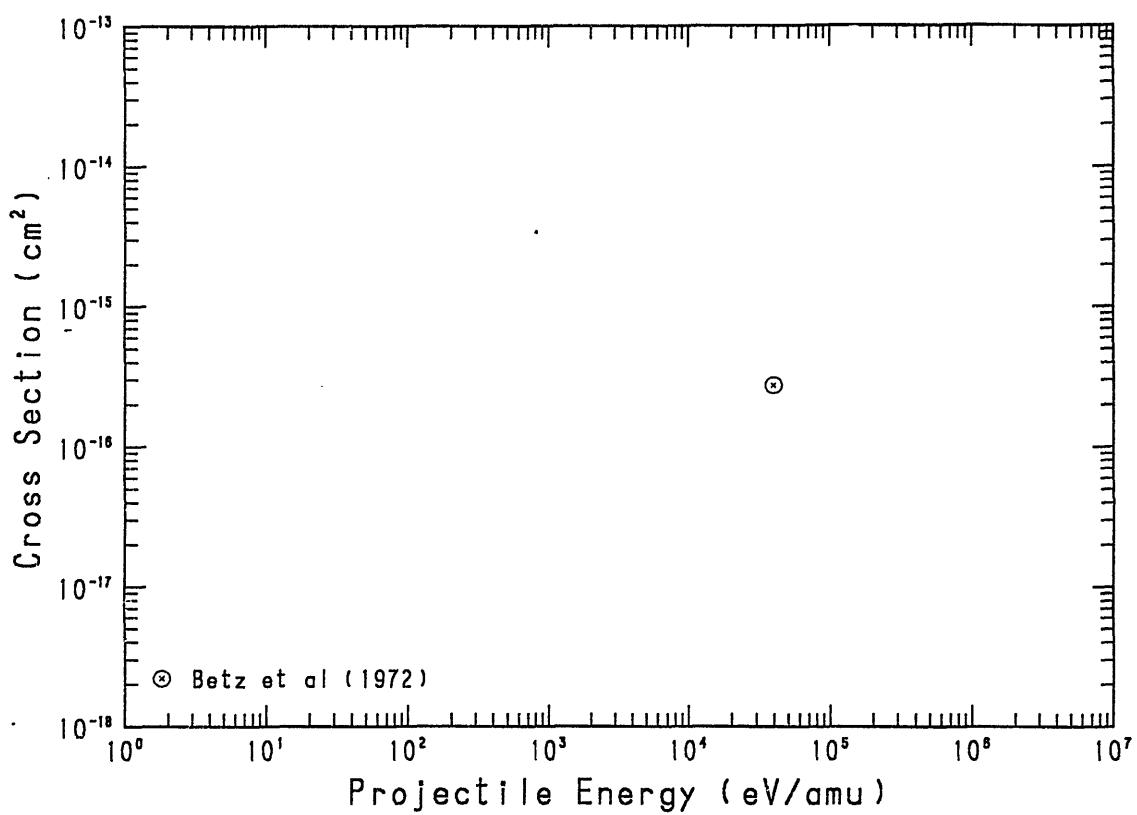


Fig.A52 $I^{2+} + H_2 \rightarrow I^{4+}$

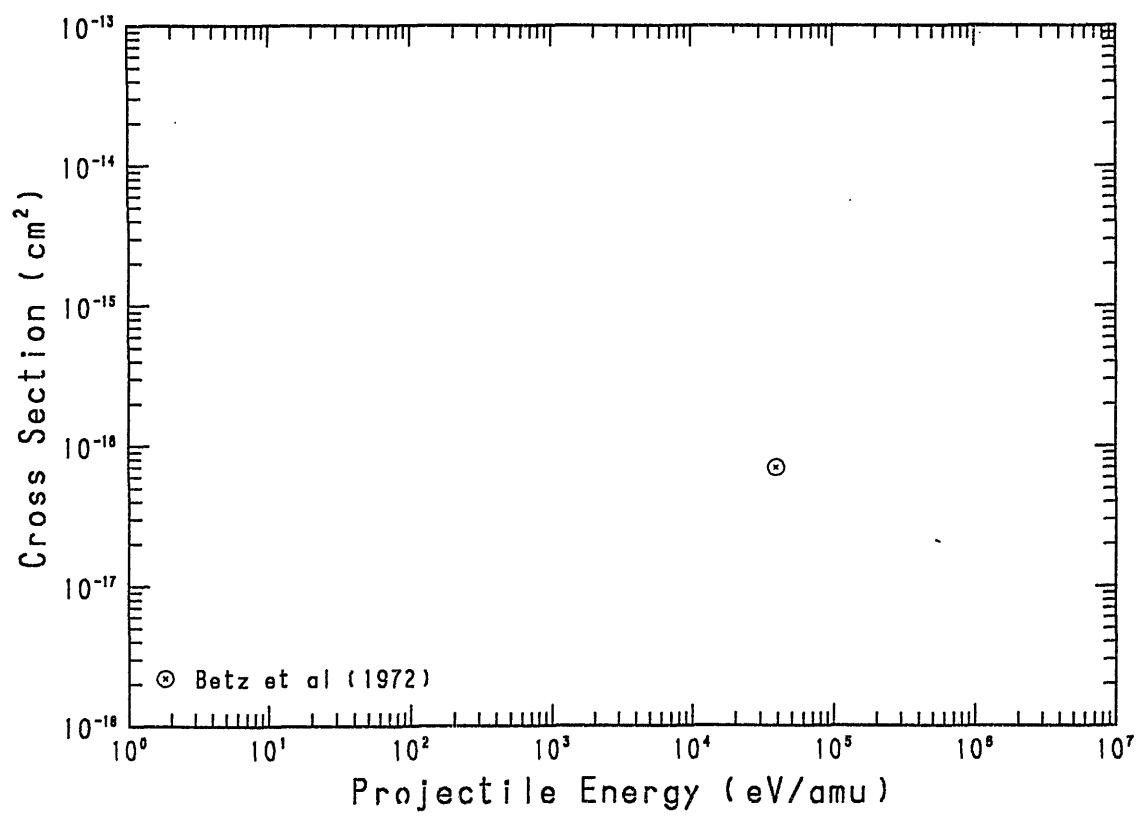


Fig.A53 $I^{2+} + H_2 \rightarrow I^{5+}$

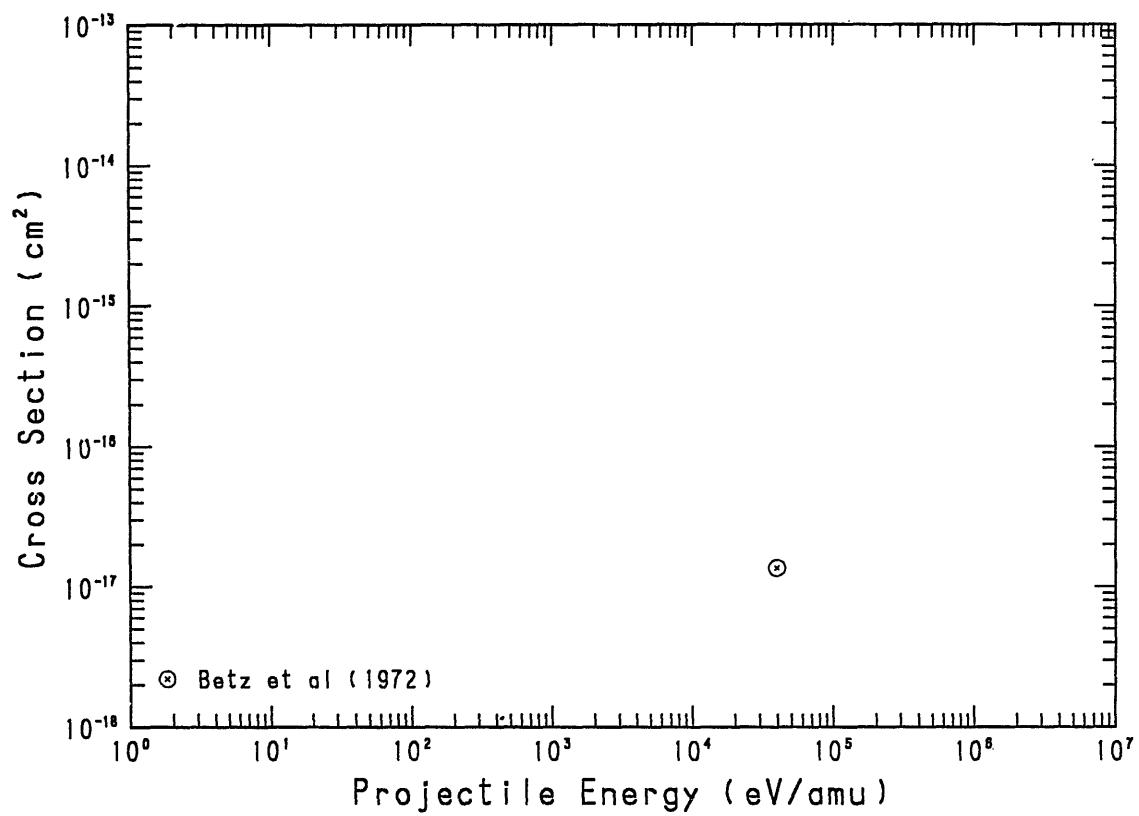


Fig.A54 $I^{3+} + H \rightarrow I^{4+}$

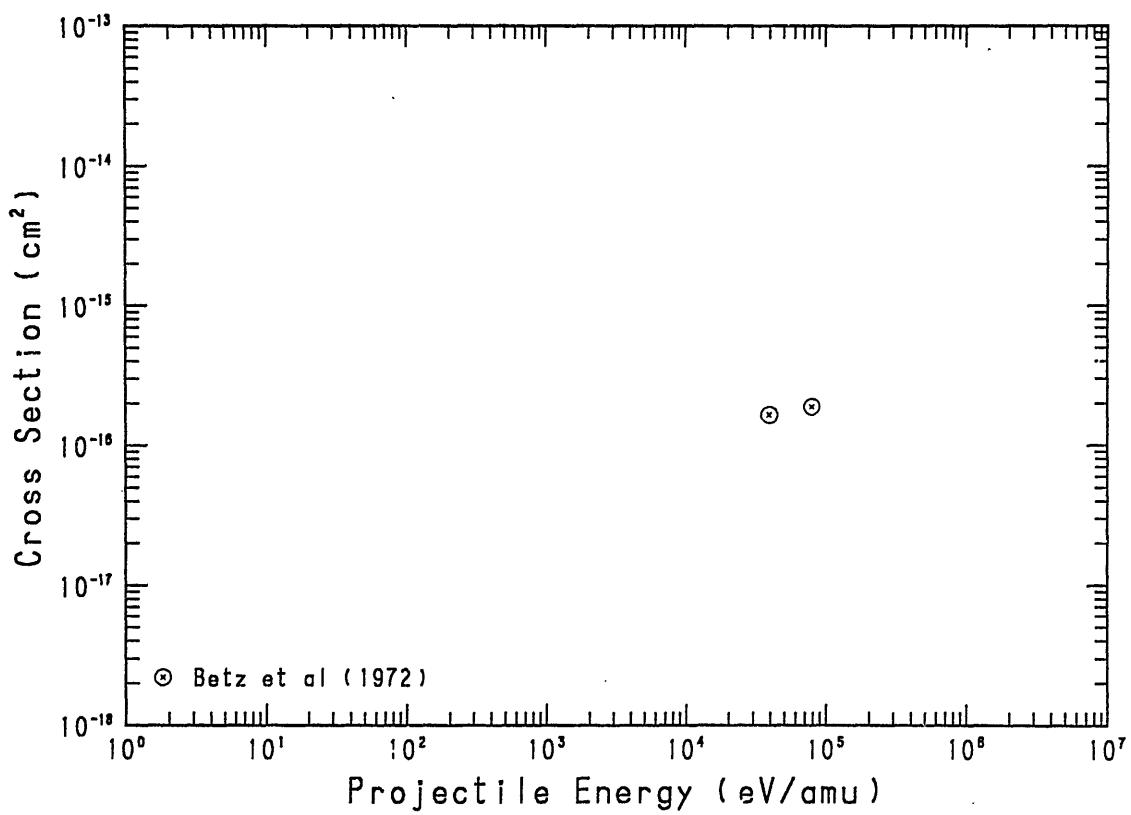


Fig.A55 $\text{I}^{3+} + \text{H}_2 \rightarrow \text{I}^{5+}$

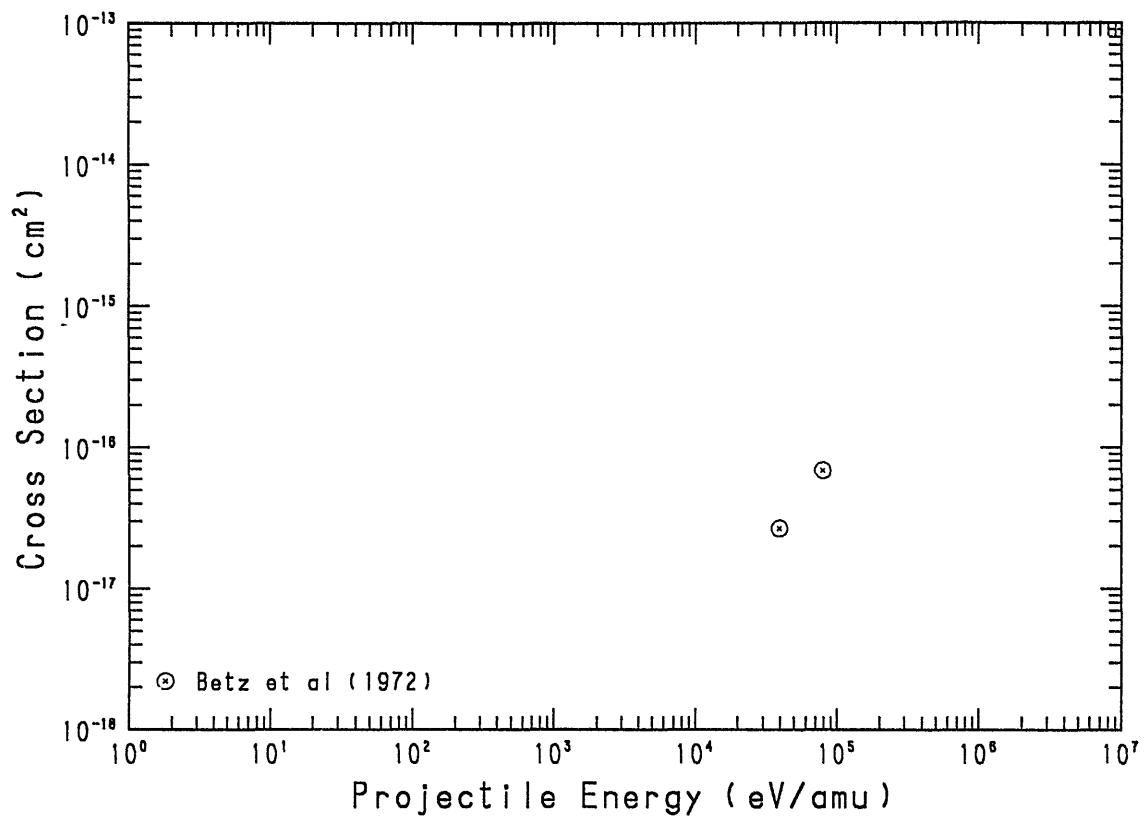


Fig.A56 $\text{I}^{3+} + \text{H}_2 \rightarrow \text{I}^{6+}$

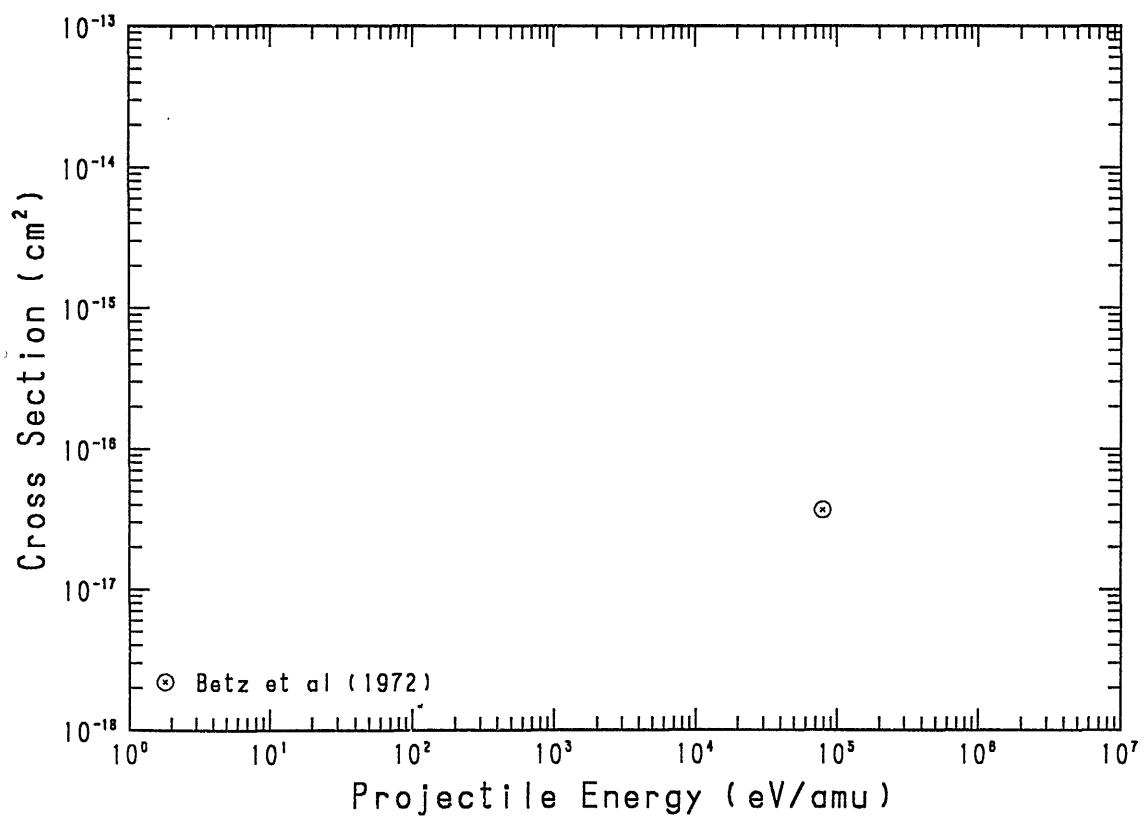


Fig.A57 $\text{I}^{4+} + \text{H}_2 \rightarrow \text{I}^{5+}$

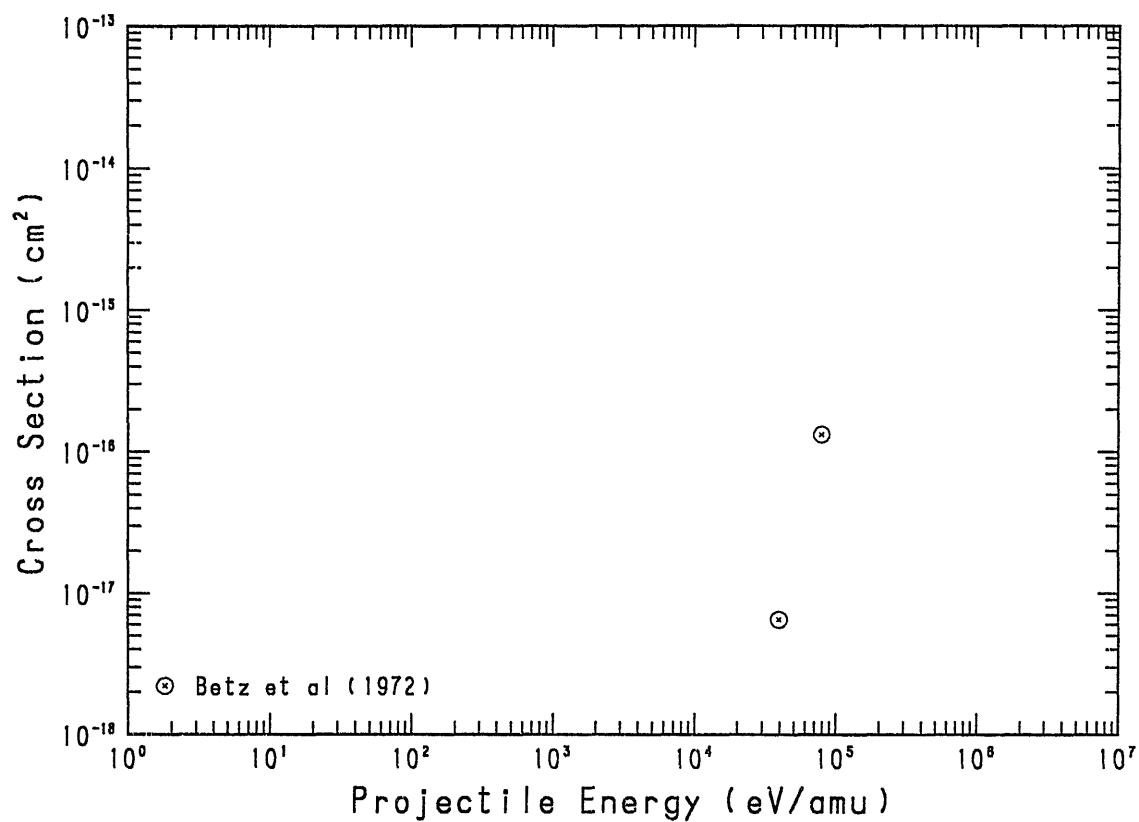


Fig.A58 $\text{I}^{4+} + \text{H}_2 \rightarrow \text{I}^{6+}$

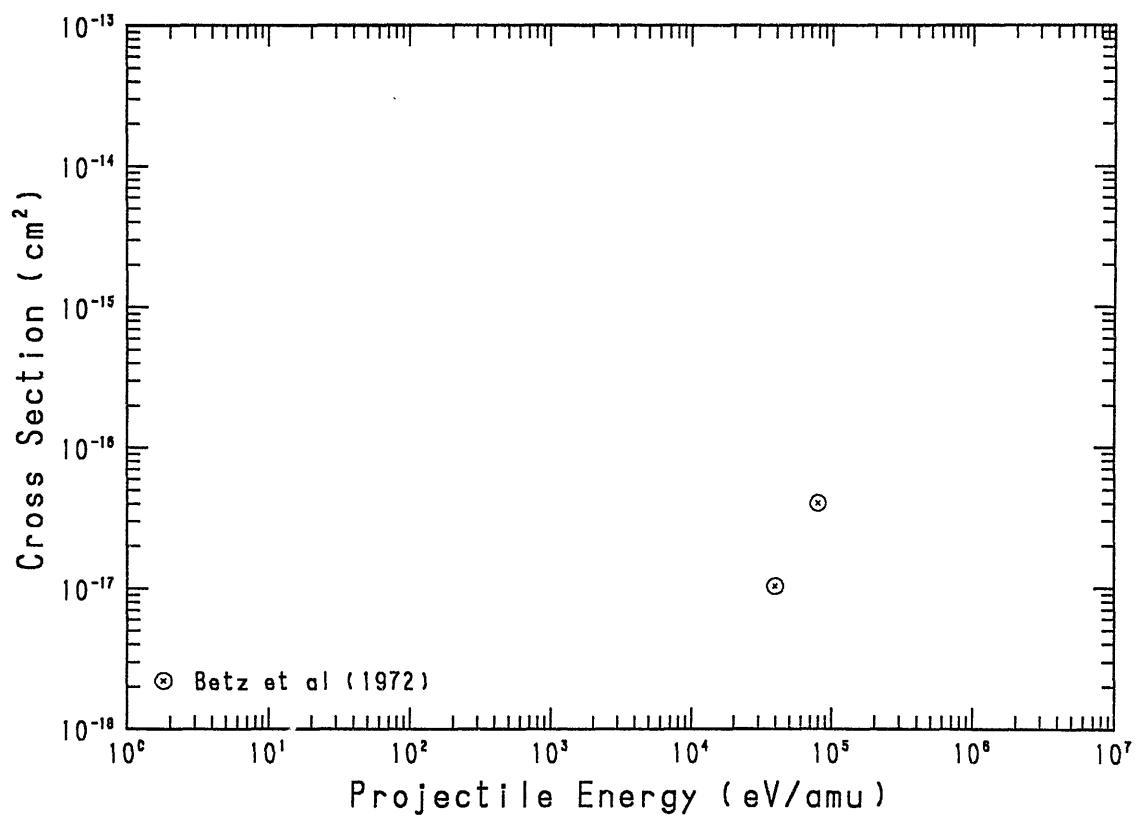


Fig.A59 $I^{4+} + H_2 \rightarrow I^{7+}$

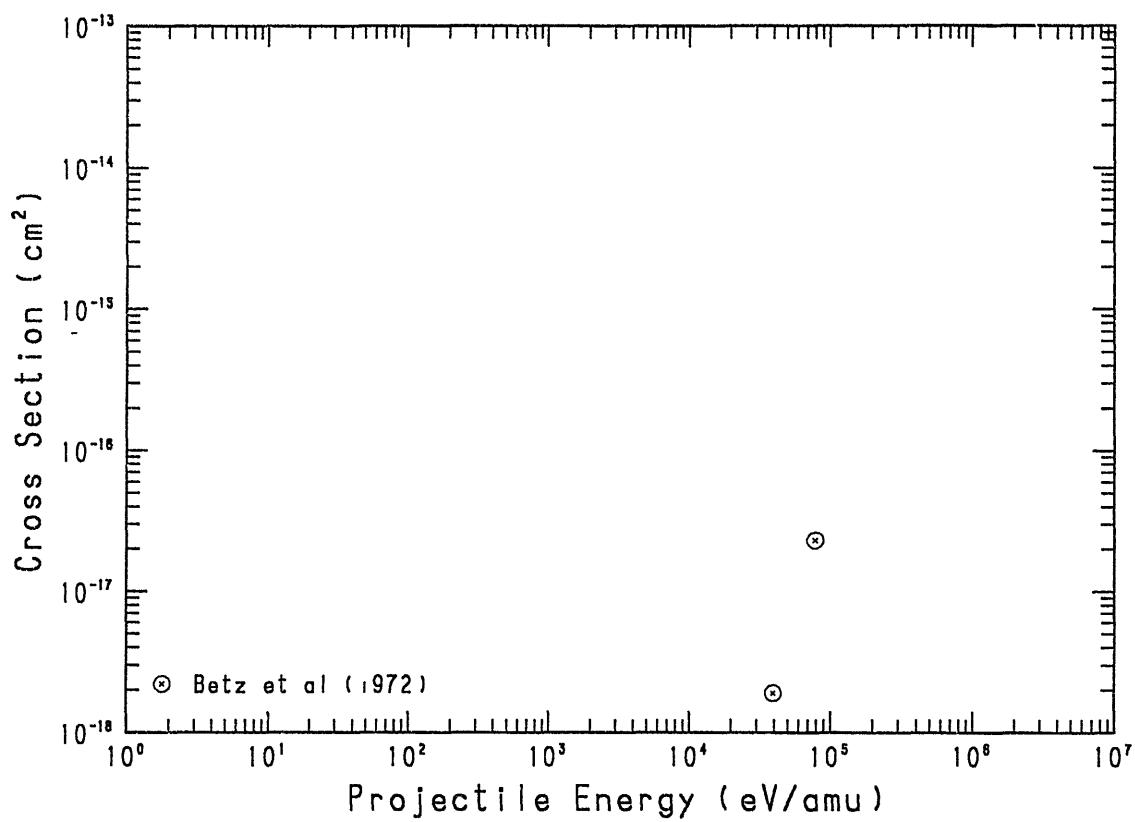


Fig.A60 $I^{5+} + H_2 \rightarrow I^{6+}$

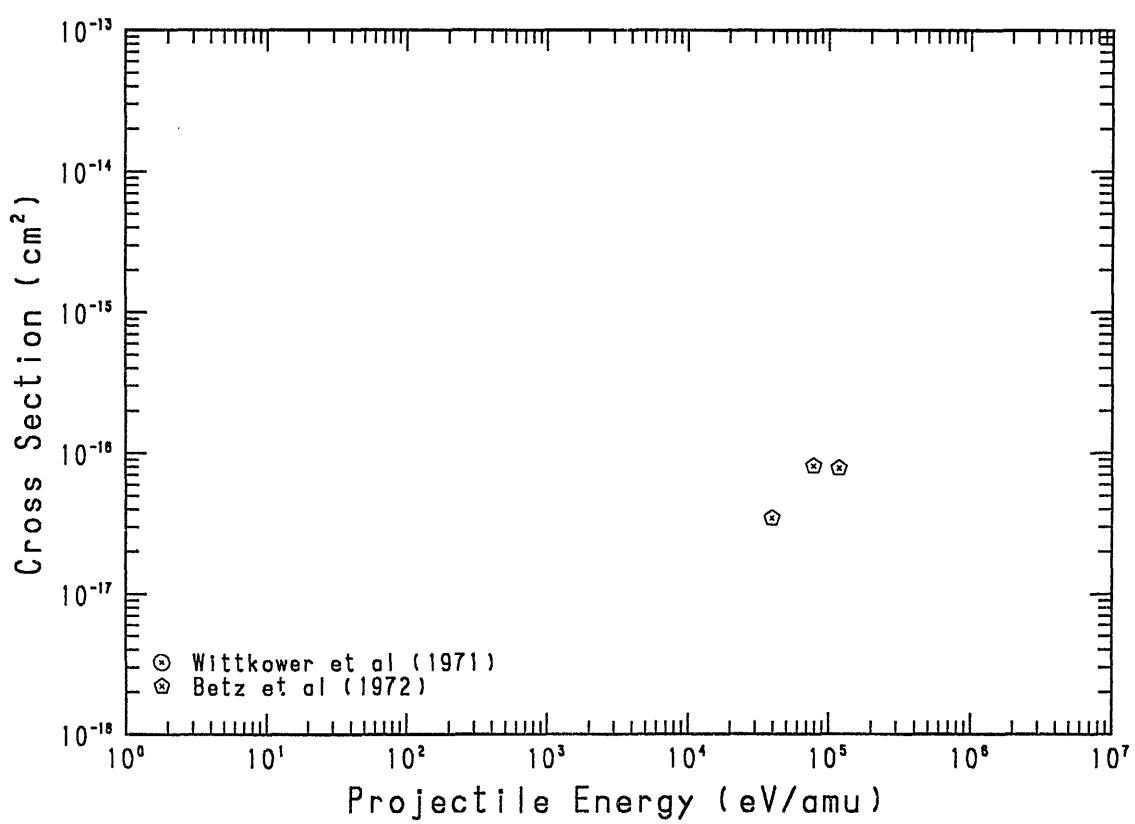


Fig.A61 $I^{5+} + H_2 \rightarrow I^{7+}$

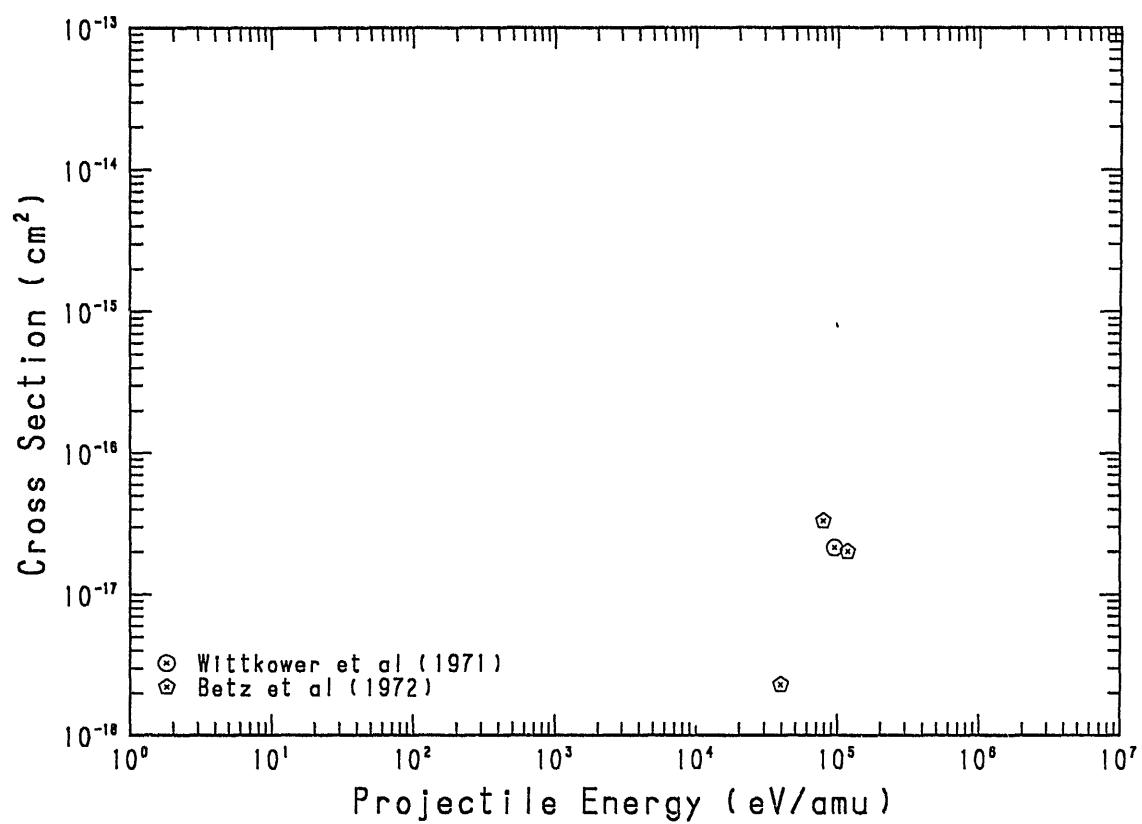


Fig.A62 $I^{5+} + H_2 \rightarrow I^{8+}$

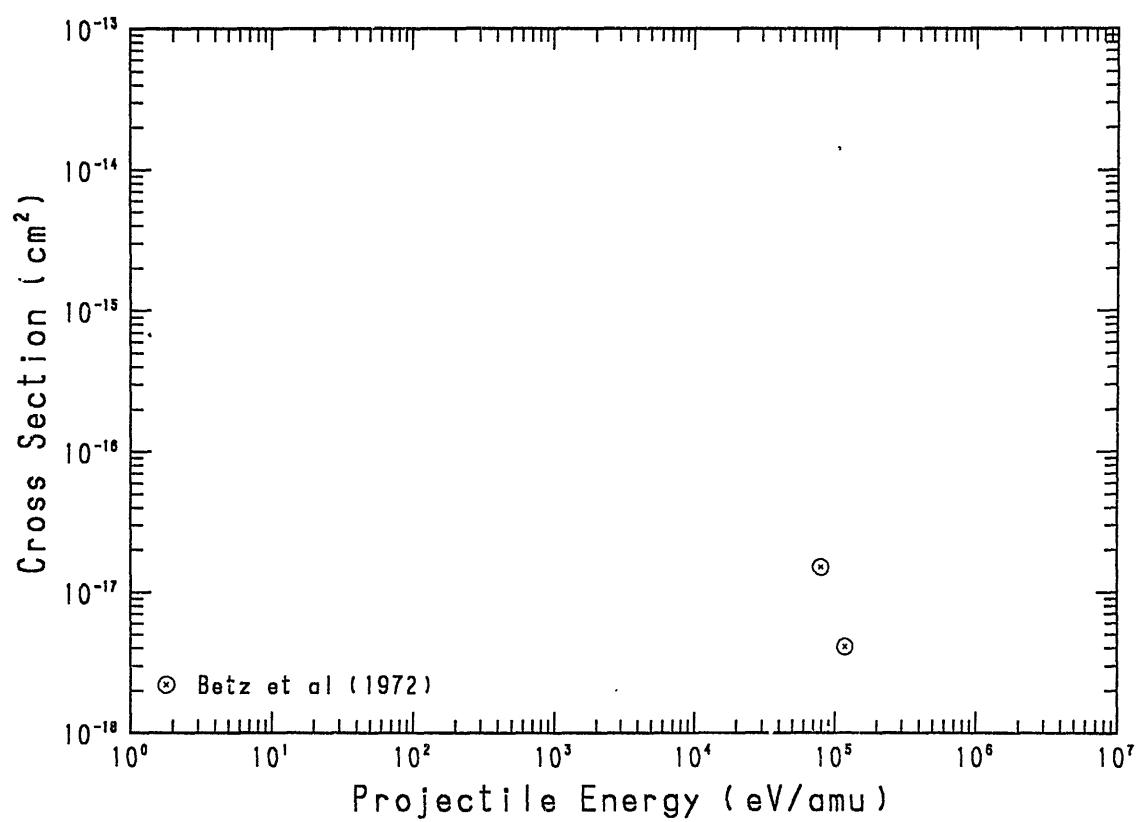


Fig.A63 $I^{6+} + H_2 \rightarrow I^{7+}$

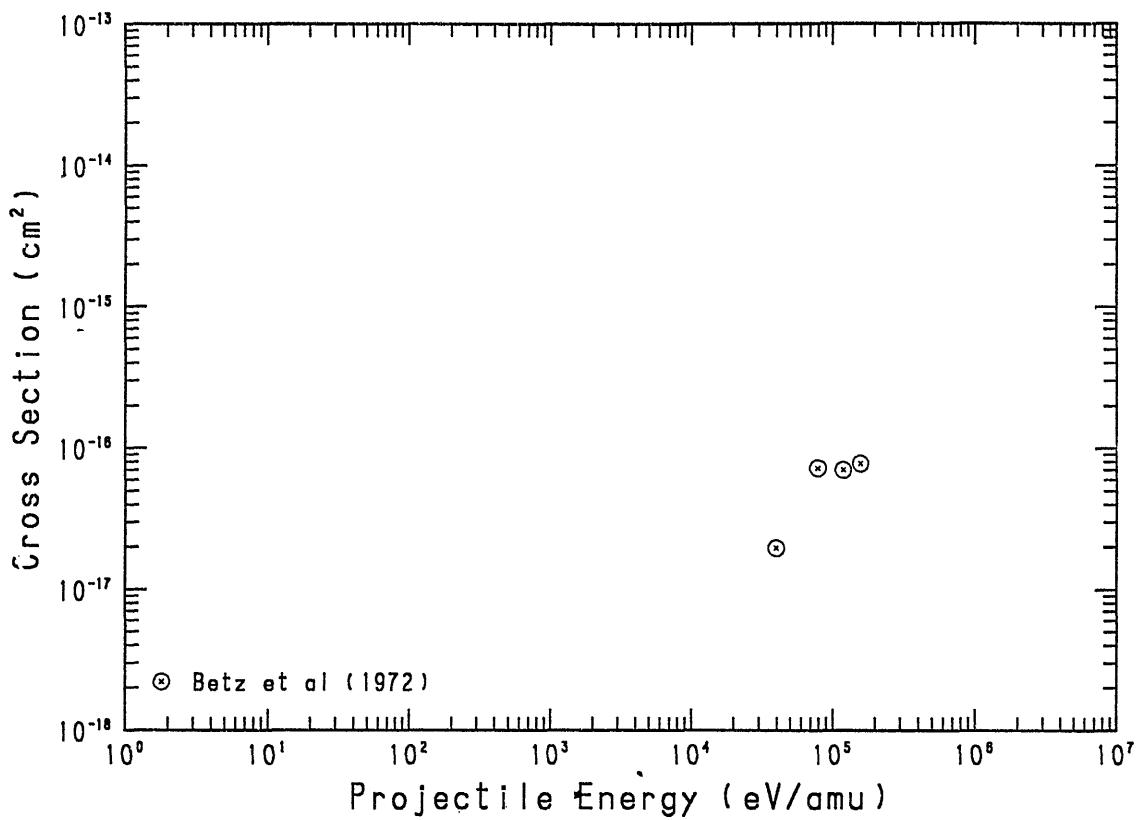


Fig.A64 $I^{6+} + H_2 \rightarrow I^{6+}$

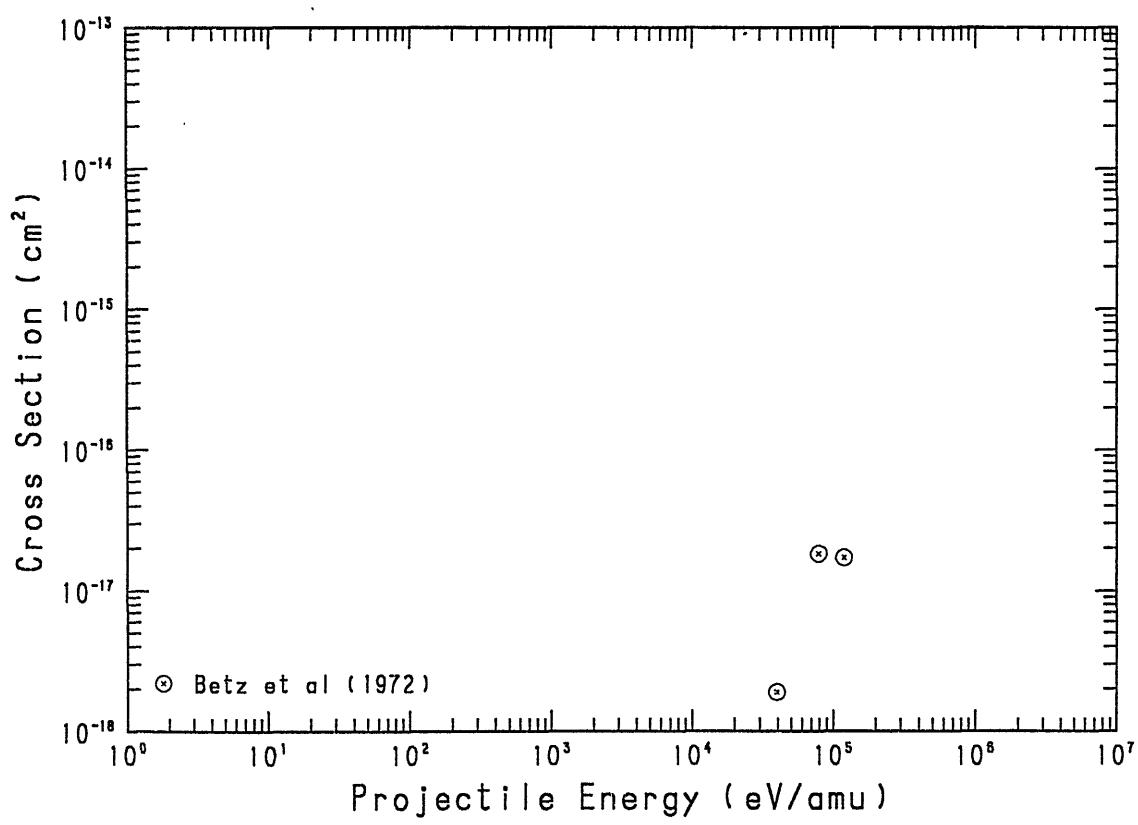


Fig.A65 $I^{6+} + H_2 \rightarrow I^{9+}$

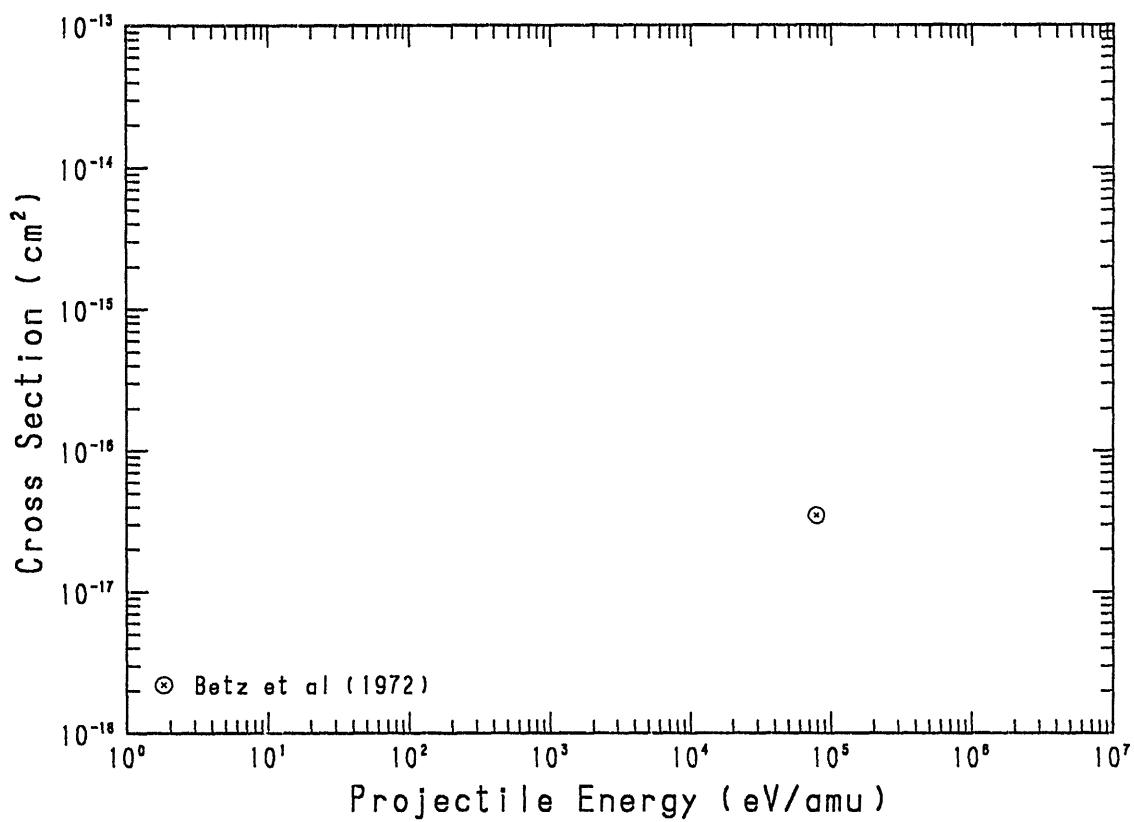


Fig.A66 $I^{7+} + H_2 \rightarrow I^{8+}$

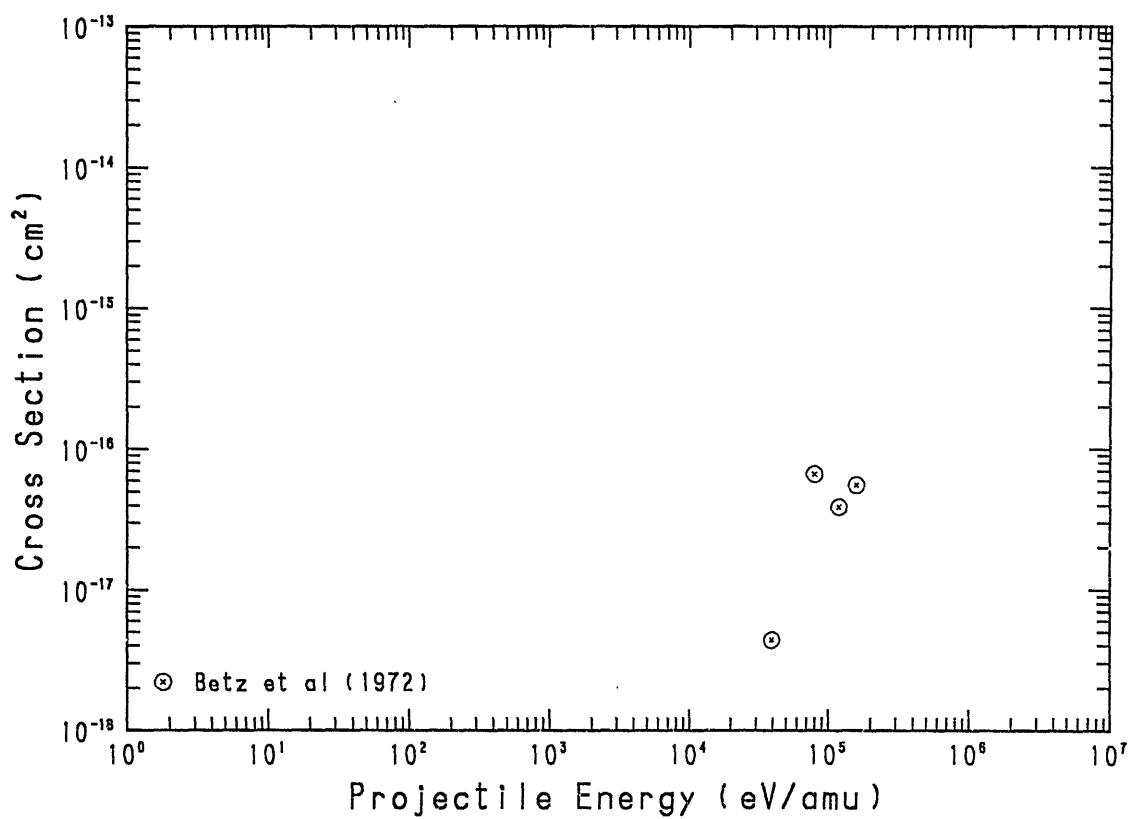


Fig.A67 $I^{7+} + H_2 \rightarrow I^{9+}$

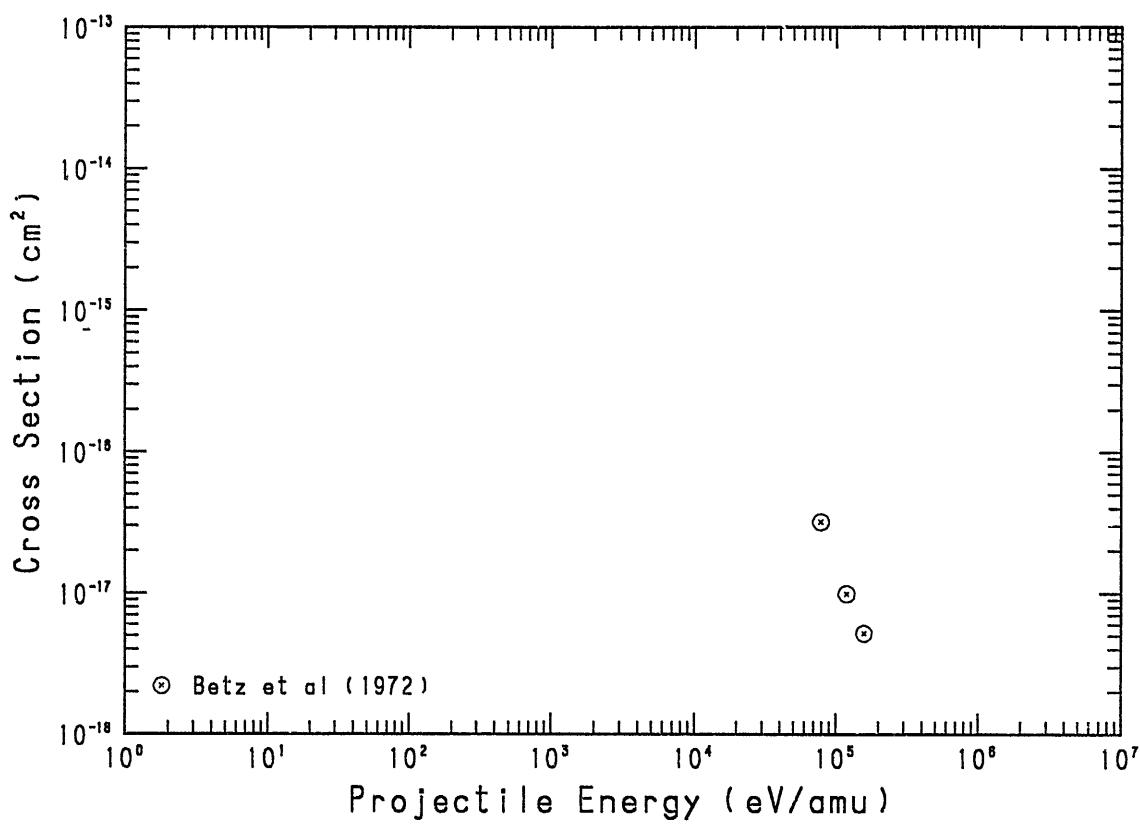


Fig.A68 $I^{8+} + H_2 \rightarrow I^{9+}$

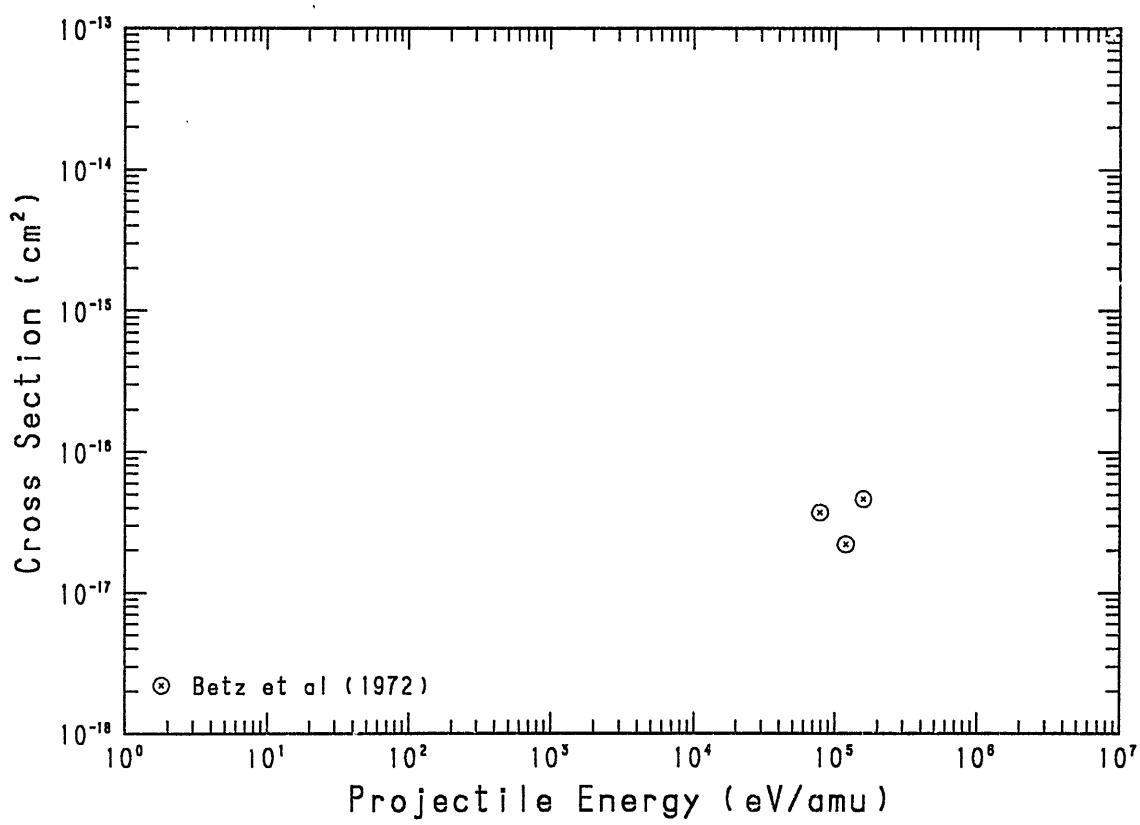


Fig.A69 $I^{8+} + H_2 \rightarrow I^{10+}$

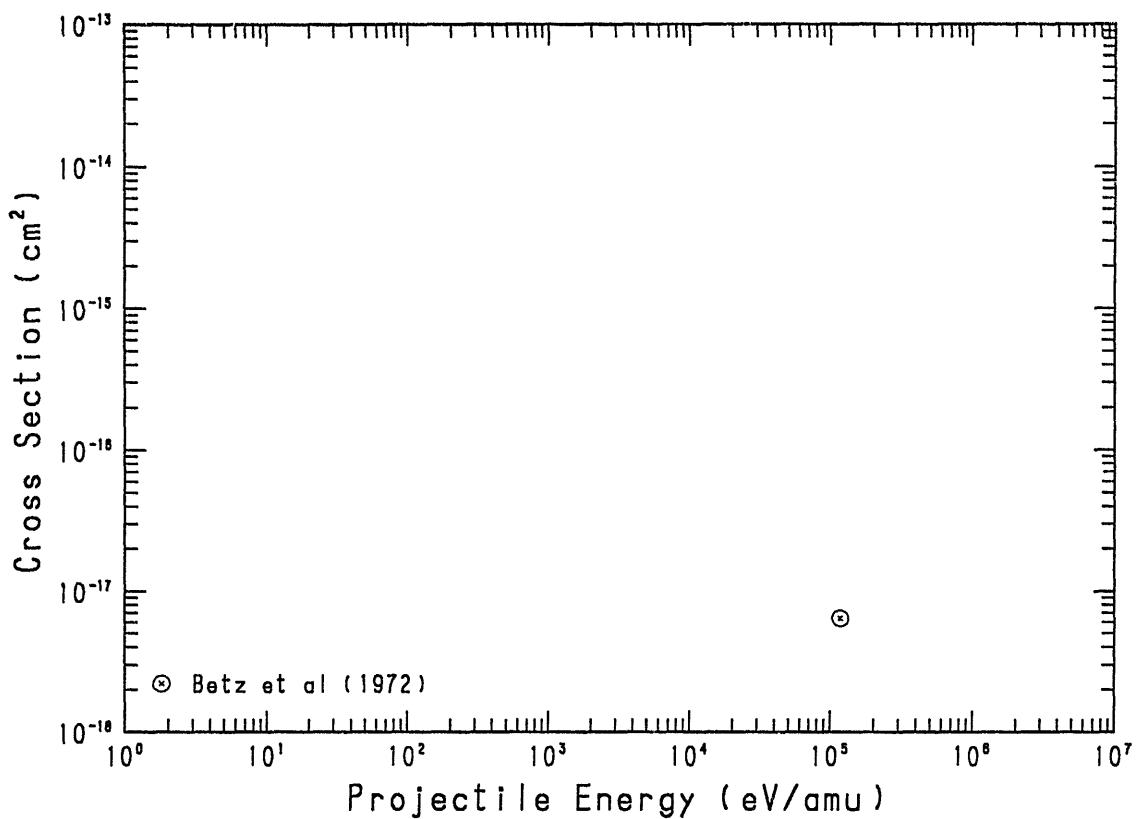


Fig.A70 $I^{8+} + H_2 \rightarrow I^{10+}$

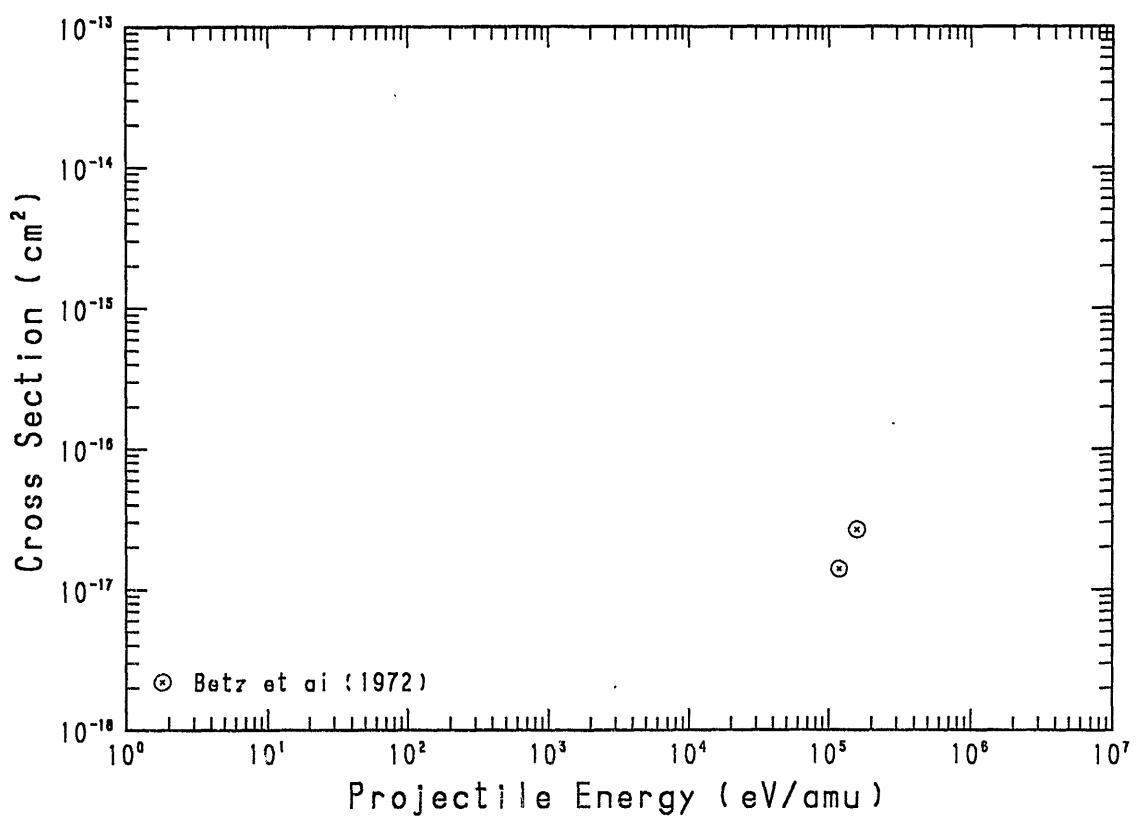


Fig.A71 $I^{9+} + H_2 \rightarrow I^{11+}$

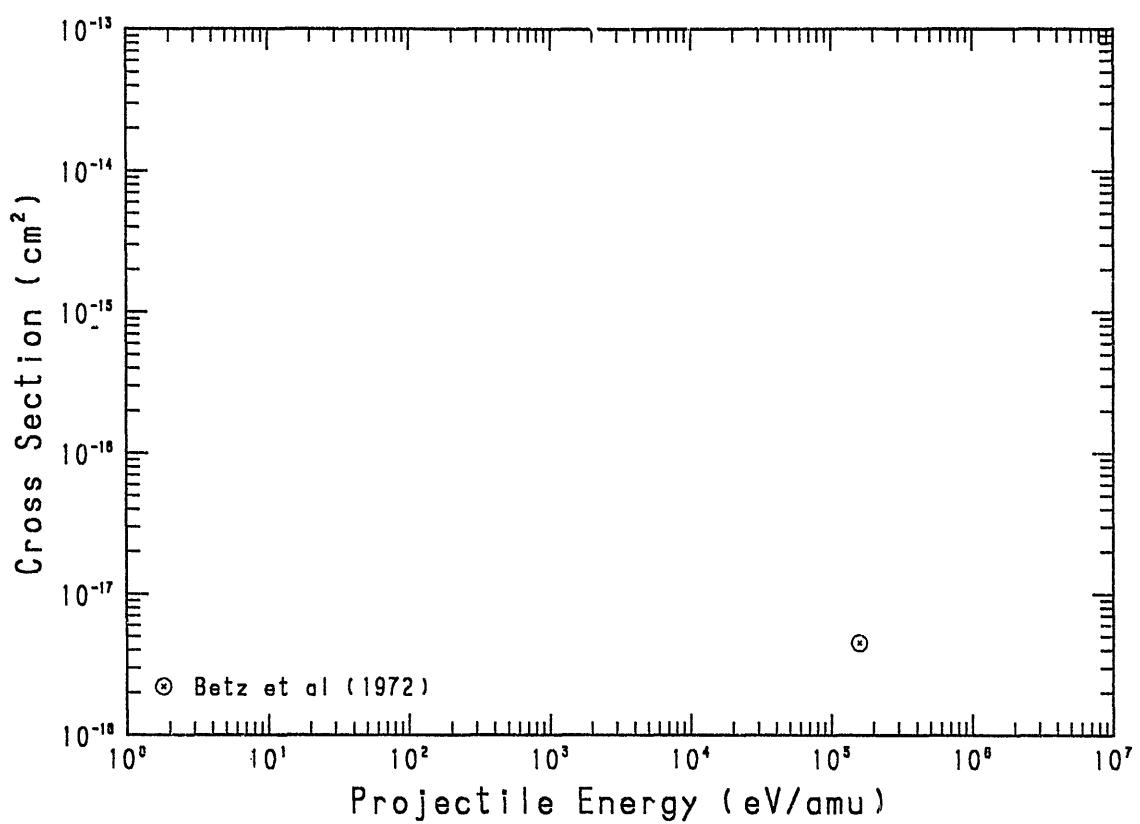
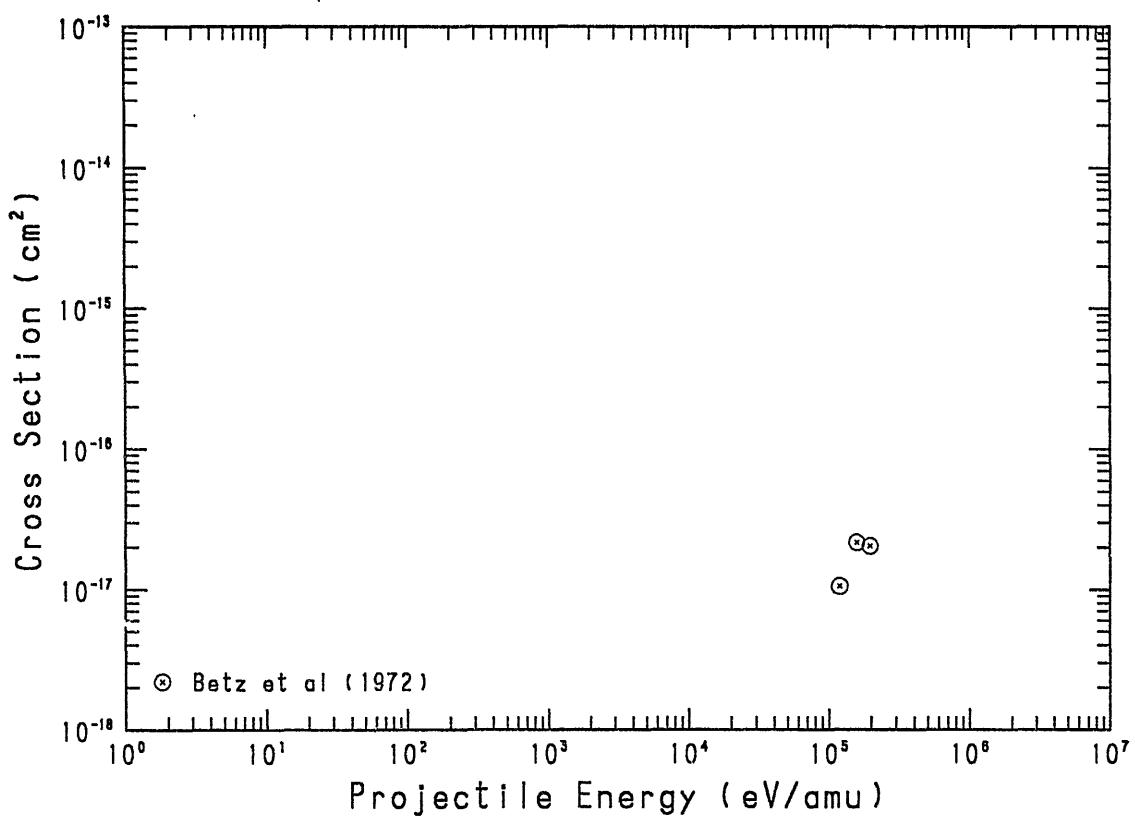


Fig.A72 $I^{10+} + H_2 \rightarrow I^{11+}$



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Available upon request to Research Information Center, Institute of Plasma Physics, Nagoya University, Nagoya 464, Japan, except for the reports noted with*.