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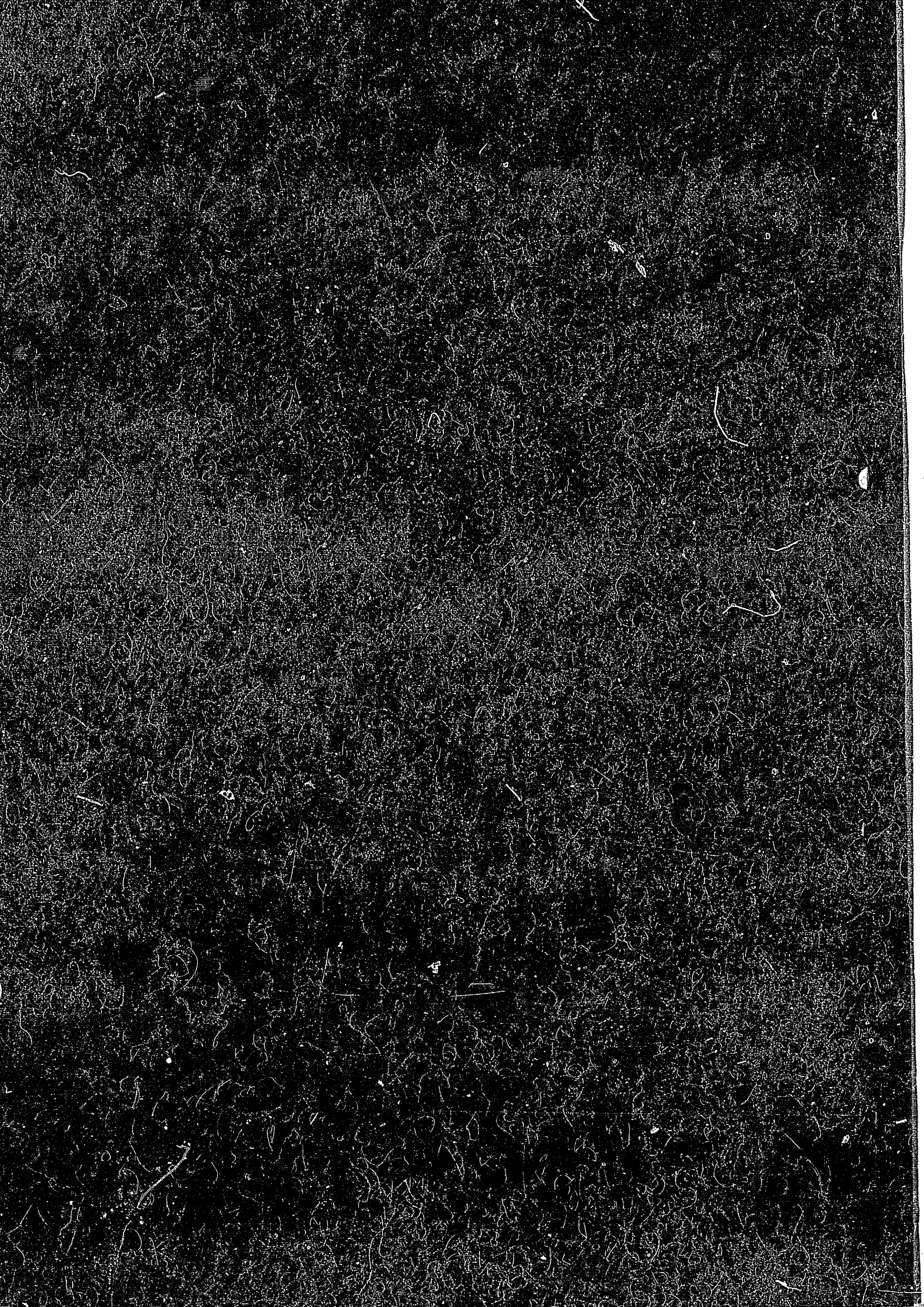

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Abstract

Compiled are expermental 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

In a recent report,[1] a compilation has been published of charge transfer cross sections for collisions of ions and hydrogen atoms. As a continuation of the work, similar cross sections for hydrogen molecules are compiled in the present report. Those cross sections are not only of considerable importance in understanding charge transfer mechanisms but also often employed as a standard in the normalization of the cross section for atomic hydrogen.

Experimental data for the processes

(1) electron capture

$$X^{q+} + H_2 \longrightarrow X^{(q-n)+}$$

(2) electron loss

$$X^{q+} + H_2 \longrightarrow X^{(q+n)+}$$

are collected for any element X heavier than helium and any charge state q (> 0). In most cases only one electron is transfered (i.e., n = 1). As far as the data exist, cross sections are shown for multi-electron transfers (n > 1). The data are shown in graphs, where the cross section and the incident energy of the ions are expressed in the units of cm^2/molecule and eV/amu, respectively. The literature has been surveyed through early 1980.

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I. LIST OF PROCESSES SHOWN IN GRAPHS

Charge Transfer

Fig. No.	Processes	References
1.	$Li^{+} + H_2 \longrightarrow Li$	10, 20
2.	$Li^{2+} + H_2 \longrightarrow Li^{+}$	3, 10, 20
3.	$Li^{3+} + H_2 \longrightarrow Li^{2+}$	10, 20
4.	$B^{+} + H_2 \longrightarrow B$	29
5.	$B^{2+} + H_2 \longrightarrow B^{+}$	24, 29, 30
6.	$B^{3+} + H_2 \longrightarrow B^{+}$	30
7.	$B^{3+} + H_2 \longrightarrow B^{2+}$	24, 29, 30
8.	$B^{4+} + H_2 \longrightarrow B^{2+}$	30
9.	$B^{4+} + H_2 \longrightarrow B^{3+}$	24, 29, 30
10.	$B^{5+} + H_2 \longrightarrow B^{4+}$	24, 29
11.	$C^{+} + H_2 \longrightarrow C$	21, 27, 29
12.	$C^{2+} + H_2 \longrightarrow C^{+}$	19, 21, 30, 29
13.	$C^{3+} + H_2 \longrightarrow C^{2+}$	18, 21, 29, 24
14.	$C^{4+} + H_2 \longrightarrow C^{2+}$	18
15.	$C^{4+} + H_2 \longrightarrow C^{3+}$	18, 21, 30, 24, 29
16.	$C^{5+} + H_2 \longrightarrow C^{4+}$	24, 29
17.	$C^{6+} + H_2 \longrightarrow C^{5+}$	29
18.	$N^{+} + H_2 \longrightarrow N$	21, 27
19.	$N^{2+} + H_2 \longrightarrow N^{+}$	27, 30
20.	$N^{3+} + H_2 \longrightarrow N^{2+}$	18, 21, 24
21.	$N^{4+} + H_2 \longrightarrow N^{3+}$	18, 21, 24
22.	$N^{5+} + H_2 \longrightarrow N^{3+}$	18
23.	$N^{5+} + H_2 \longrightarrow N^{4+}$	18, 21, 24

Fig. No.	Processes	References
24.	$O^{+} + H_2 \longrightarrow O$	21, 27
25.	$O^{2+} + H_2 \longrightarrow O$	4
26.	$O^{2+} + H_2 \longrightarrow O^{+}$	4, 21, 30
27.	$O^{3+} + H_2 \longrightarrow O^{2+}$	18, 21, 25
28.	$O^{4+} + H_2 \longrightarrow O^{3+}$	18, 21
29.	$O^{5+} + H_2 \longrightarrow O^{3+}$	18
30.	$O^{5+} + H_2 \longrightarrow O^{4+}$	18, 21, 24
31.	$O^{6+} + H_2 \longrightarrow O^{4+}$	18
32.	$O^{6+} + H_2 \longrightarrow O^{5+}$	18, 24
33.	$F^{+} + H_2 \longrightarrow F$	13
34.	$F^{9+} + H_2 \longrightarrow F^{8+}$	15
35.	$Ne^{+} + H_2 \longrightarrow Ne$	1, 5, 16
36.	$Ne^{2+} + H_2 \longrightarrow Ne^{+}$	16
37.	$Ne^{3+} + H_2 \longrightarrow Ne^{2+}$	16
38.	$Mg^{2+} + H_2 \longrightarrow Mg^{+}$	26
39.	$Si^{2+} + H_2 \longrightarrow Si^{+}$	22
40.	$Si^{3+} + H_2 \longrightarrow Si^{2+}$	22
41.	$Si^{4+} + H_2 \longrightarrow Si^{3+}$	22
42.	$Si^{5+} + H_2 \longrightarrow Si^{4+}$	22
43.	$Si^{6+} + H_2 \longrightarrow Si^{5+}$	22
44.	$Si^{7+} + H_2 \longrightarrow Si^{6+}$	22
45.	$Si^{8+} + H_2 \longrightarrow Si^{7+}$	22
46.	$Si^{9+} + H_2 \longrightarrow Si^{8+}$	22
47.	$Si^{11+} + H_2 \longrightarrow Si^{10+}$	22

Fig. No.	Processes	References
48.	$Cl^{3+} + H_2 \longrightarrow Cl^{2+}$	7
49.	$Cl^{4+} + H_2 \longrightarrow Cl^{3+}$	7
50.	$K^{+} + H_2 \longrightarrow K$	14
51.	$Ar^{+} + H_2 \longrightarrow Ar$	1, 2, 5
52.	$Ar^{2+} + H_2 \longrightarrow Ar^{+}$	32, 31
53.	$Ar^{3+} + H_2 \longrightarrow Ar^{+}$	32
54.	$Ar^{3+} + H_2 \longrightarrow Ar^{2+}$	32, 31
55.	$Ar^{4+} + H_2 \longrightarrow Ar^{2+}$	32
56.	$Ar^{4+} + H_2 \longrightarrow Ar^{3+}$	32, 31
57.	$Ar^{5+} + H_2 \longrightarrow Ar^{4+}$	31
58.	$Ar^{6+} + H_2 \longrightarrow Ar^{5+}$	33, 32, 31
59.	$Ar^{7+} + H_2 \longrightarrow Ar^{6+}$	31
60.	$Ar^{8+} + H_2 \longrightarrow Ar^{7+}$	24, 31
61.	$Ar^{9+} + H_2 \longrightarrow Ar^{8+}$	31
62.	$Ti^{2+} + H_2 \longrightarrow Ti$	19
63.	$Ti^{2+} + H_2 \longrightarrow Ti^{+}$	19
64.	$Fe^{4+} + H_2 \longrightarrow Fe^{3+}$	25
65.	$Fe^{5+} + H_2 \longrightarrow Fe^{4+}$	25, 31
66.	$Fe^{6+} + H_2 \longrightarrow Fe^{5+}$	24, 25, 31
67.	$Fe^{7+} + H_2 \longrightarrow Fe^{6+}$	25
68.	$Fe^{8+} + H_2 \longrightarrow Fe^{7+}$	25
69.	$Fe^{9+} + H_2 \longrightarrow Fe^{8+}$	23
70.	$Fe^{10+} + H_2 \longrightarrow Fe^{9+}$	25
71.	$Fe^{11+} + H_2 \longrightarrow Fe^{10+}$	25

Fig. No.	Processes	References
72.	$Fe^{12+} + H_2 \longrightarrow Fe^{11+}$	23, 25
73.	$Fe^{13+} + H_2 \longrightarrow Fe^{12+}$	25
74.	$Fe^{14+} + H_2 \longrightarrow Fe^{13+}$	23, 25
75.	$Fe^{15+} + H_2 \longrightarrow Fe^{14+}$	25
76.	$Fe^{16+} + H_2 \longrightarrow Fe^{15+}$	23
77.	$Fe^{18+} + H_2 \longrightarrow Fe^{17+}$	23
78.	$Fe^{20+} + H_2 \longrightarrow Fe^{19+}$	17, 23
79.	$Fe^{21+} + H_2 \longrightarrow Fe^{20+}$	17
80.	$Fe^{22+} + H_2 \longrightarrow Fe^{21+}$	17, 23
81.	$Fe^{23+} + H_2 \longrightarrow Fe^{22+}$	17
82.	$Fe^{24+} + H_2 \longrightarrow Fe^{23+}$	17
83.	$Fe^{25+} + H_2 \longrightarrow Fe^{24+}$	17
84.	$Zn^{2+} + H_2 \longrightarrow Zn^{+}$	26
85.	$Br^{3+} + H_2 \longrightarrow Br^{2+}$	6
86.	$Br^{4+} + H_2 \longrightarrow Br^{3+}$	6, 9
87.	$Br^{5+} + H_2 \longrightarrow Br^{4+}$	6, 9
88.	$Br^{6+} + H_2 \longrightarrow Br^{4+}$	9
89.	$Br^{6+} + H_2 \longrightarrow Br^{5+}$	6, 9
90.	$Br^{7+} + H_2 \longrightarrow Br^{5+}$	9
91.	$Br^{7+} + H_2 \longrightarrow Br^{6+}$	6, 9
92.	$Br^{8+} + H_2 \longrightarrow Br^{6+}$	9
93.	$Br^{8+} + H_2 \longrightarrow Br^{7+}$	6, 9
94.	$Br^{9+} + H_2 \longrightarrow Br^{8+}$	6
95.	$Br^{10+} + H_2 \longrightarrow Br^{9+}$	6
96.	$Br^{11+} + H_2 \longrightarrow Br^{10+}$	6

Fig. No.	Processes	References
97.	$Br^{12+} + H_2 \longrightarrow Br^{11+}$	6
98.	$Kr^{2+} + H_2 \longrightarrow Kr^{+}$	28
99.	$Mo^{4+} + H_2 \longrightarrow Mo^{3+}$	25
100.	$Mo^{5+} + H_2 \longrightarrow Mo^{4+}$	25
101.	$Mo^{6+} + H_2 \longrightarrow Mo^{5+}$	25
102.	$Mo^{7+} + H_2 \longrightarrow Mo^{6+}$	25
103.	$Mo^{8+} + H_2 \longrightarrow Mo^{7+}$	25
104.	$Mo^{9+} + H_2 \longrightarrow Mo^{8+}$	25
105.	$Mo^{10+} + H_2 \longrightarrow Mo^{9+}$	25
106.	$Mo^{11+} + H_2 \longrightarrow Mo^{10+}$	25
107.	$Mo^{12+} + H_2 \longrightarrow Mo^{11+}$	25
108.	$Mo^{13+} + H_2 \longrightarrow Mo^{12+}$	25
109.	$Mo^{14+} + H_2 \longrightarrow Mo^{13+}$	25
110.	$Mo^{15+} + H_2 \longrightarrow Mo^{14+}$	25
111.	$Mo^{16+} + H_2 \longrightarrow Mo^{15+}$	25
112.	$Mo^{17+} + H_2 \longrightarrow Mo^{16+}$	25
113.	$Mo^{18+} + H_2 \longrightarrow MO^{17+}$	25
114.	$Cd^{2+} + H_2 \longrightarrow Cd^{+}$	26
115.	$I^{2+} + H_2 \longrightarrow I$	11
116.	$I^{2+} + H_2 \longrightarrow I^{+}$	11
117.	$I^{3+} + H_2 \longrightarrow I^{+}$	11
118.	$I^{3+} + H_2 \longrightarrow I^{2+}$	11
119.	$I^{4+} + H_2 \longrightarrow I^{2+}$	11
120.	$I^{4+} + H_2 \longrightarrow I^{3+}$	11
121.	$I^{5+} + H_2 \longrightarrow I^{3+}$	8, 11

Fig. No.	Processes	References
122.	$I^{5+} + H_2 \longrightarrow I^{4+}$	8, 11
123.	$I^{6+} + H_2 \longrightarrow I^{4+}$	11
124.	$I^{6+} + H_2 \longrightarrow I^{5+}$	11
125.	$I^{7+} + H_2 \longrightarrow I^{5+}$	11
126.	$I^{7+} + H_2 \longrightarrow I^{6+}$	11
127.	$I^{8+} + H_2 \longrightarrow I^{6+}$	11
128.	$I^{8+} + H_2 \longrightarrow I^{7+}$	11
129.	$I^{9+} + H_2 \longrightarrow I^{7+}$	11
130.	$I^{9+} + H_2 \longrightarrow I^{8+}$	11
131.	$I^{10+} + H_2 \longrightarrow I^{8+}$	11
132.	$I^{10+} + H_2 \longrightarrow I^{9+}$	11
133.	$I^{11+} + H_2 \longrightarrow I^{10+}$	11
134.	$I^{12+} + H_2 \longrightarrow I^{11+}$	11
135.	$I^{13+} + H_2 \longrightarrow I^{12+}$	11
136.	$I^{14+} + H_2 \longrightarrow I^{13+}$	11
137.	$I^{15+} + H_2 \longrightarrow I^{14+}$	11
138.	$I^{16+} + H_2 \longrightarrow I^{15+}$	11
139.	$I^{17+} + H_2 \longrightarrow I^{16+}$	11
140.	$I^{18+} + H_2 \longrightarrow I^{17+}$	11
141.	$Xe^{2+} + H_2 \longrightarrow Xe^{+}$	31
142.	$Xe^{3+} + H_2 \longrightarrow Xe^{2+}$	31
143.	$Xe^{4+} + H_2 \longrightarrow Xe^{3+}$	31
144.	$Xe^{5+} + H_2 \longrightarrow Xe^{4+}$	31
145.	$Xe^{6+} + H_2 \longrightarrow Xe^{5+}$	31
146.	$Xe^{7+} + H_2 \longrightarrow Xe^{6+}$	31

Fig. No.	Processes	References
147.	$Xe^{8+} + H_2 \longrightarrow Xe^{7+}$	31
148.	$Xe^{9+} + H_2 \longrightarrow Xe^{8+}$	31
149.	$Xe^{10+} + H_2 \longrightarrow Xe^{9+}$	31
150.	$Xe^{11+} + H_2 \longrightarrow Xe^{10+}$	31
151.	$Xe^{12+} + H_2 \longrightarrow Xe^{11+}$	31
152.	$Ba^{2+} + H_2 \longrightarrow Ba^{+}$	28
153.	$Ta^{3+} + H_2 \longrightarrow Ta^{2+}$	25
154.	$Ta^{4+} + H_2 \longrightarrow Ta^{3+}$	25
155.	$Ta^{5+} + H_2 \longrightarrow Ta^{4+}$	25
156.	$Ta^{6+} + H_2 \longrightarrow Ta^{5+}$	25
157.	$Ta^{7+} + H_2 \longrightarrow Ta^{6+}$	25
158.	$Ta^{8+} + H_2 \longrightarrow Ta^{7+}$	25
159.	$Ta^{9+} + H_2 \longrightarrow Ta^{8+}$	25
160.	$Ta^{10+} + H_2 \longrightarrow Ta^{9+}$	25
161.	$Ta^{11+} + H_2 \longrightarrow Ta^{10+}$	25
162.	$Ta^{12+} + H_2 \longrightarrow Ta^{11+}$	25
163.	$Ta^{13+} + H_2 \longrightarrow Ta^{12+}$	25
164.	$Ta^{14+} + H_2 \longrightarrow Ta^{13+}$	25
165.	$Ta^{15+} + H_2 \longrightarrow Ta^{14+}$	25
166.	$Ta^{16+} + H_2 \longrightarrow Ta^{15+}$	25
167.	$Ta^{17+} + H_2 \longrightarrow Ta^{16+}$	25
168.	$Ta^{18+} + H_2 \longrightarrow Ta^{17+}$	25
169.	$Ta^{19+} + H_2 \longrightarrow Ta^{18+}$	25
170.	$W^{4+} + H_2 \longrightarrow W^{3+}$	25
171.	$W^{5+} + H_2 \longrightarrow W^{4+}$	25

Fig. No.	Processes	References
172.	$W^{6+} + H_2 \longrightarrow W^{5+}$	25
173.	$W^{7+} + H_2 \longrightarrow W^{6+}$	25
174.	$W^{8+} + H_2 \longrightarrow W^{7+}$	25
175.	$W^{9+} + H_2 \longrightarrow W^{8+}$	25
176.	$W^{10+} + H_2 \longrightarrow W^{9+}$	25
177.	$W^{11+} + H_2 \longrightarrow W^{10+}$	25
178.	$W^{12+} + H_2 \longrightarrow W^{11+}$	25
179.	$W^{13+} + H_2 \longrightarrow W^{12+}$	25
180.	$W^{14+} + H_2 \longrightarrow W^{13+}$	25
181.	$W^{15+} + H_2 \longrightarrow W^{14+}$	25
182.	$Au^{5+} + H_2 \longrightarrow Au^{4+}$	25
183.	$Au^{6+} + H_2 \longrightarrow Au^{5+}$	25
184.	$Au^{7+} + H_2 \longrightarrow Au^{6+}$	25
185.	$Au^{8+} + H_2 \longrightarrow Au^{7+}$	25
186.	$Au^{9+} + H_2 \longrightarrow Au^{8+}$	25
187.	$Au^{10+} + H_2 \longrightarrow Au^{9+}$	25
188.	$Au^{11+} + H_2 \longrightarrow Au^{10+}$	25
189.	$Au^{12+} + H_2 \longrightarrow Au^{11+}$	25
190.	$Au^{13+} + H_2 \longrightarrow Au^{12+}$	25
191.	$Au^{14+} + H_2 \longrightarrow Au^{13+}$	25
192.	$Au^{15+} + H_2 \longrightarrow Au^{14+}$	25
193.	$Au^{16+} + H_2 \longrightarrow Au^{15+}$	25

Ionization

Fig. No.	Processes	References
A1.	$Li^{+} + H_2 \longrightarrow Li^{2+}$	10, 20
A2.	$Li^{2+} + H_2 \longrightarrow Li^{3+}$	10, 20
A3.	$B^{+} + H_2 \longrightarrow B^{2+}$	29
A4.	$B^{2+} + H_2 \longrightarrow B^{3+}$	29
A5.	$C^{+} + H_2 \longrightarrow C^{2+}$	29
A6.	$C^{2+} + H_2 \longrightarrow C^{3+}$	29
A7.	$C^{3+} + H_2 \longrightarrow C^{4+}$	29
A8.	$C^{4+} + H_2 \longrightarrow C^{5+}$	12
A9.	$N^{4+} + H_2 \longrightarrow N^{5+}$	12
A10.	$O^{2+} + H_2 \longrightarrow O^{3+}$	4
A11.	$Si^{3+} + H_2 \longrightarrow Si^{4+}$	22
A12	$Si^{4+} + H_2 \longrightarrow Si^{5+}$	22
A13.	$Cl^{2+} + H_2 \longrightarrow Cl^{3+}$	7
A14.	$Cl^{3+} + H_2 \longrightarrow Cl^{4+}$	7
A15.	$K^{+} + H_2 \longrightarrow K^{2+}$	14
A16.	$Fe^{20+} + H_2 \longrightarrow Fe^{21+}$	17
A17.	$Fe^{21+} + H_2 \longrightarrow Fe^{22+}$	17
A18.	$Fe^{22+} + H_2 \longrightarrow Fe^{23+}$	17
A19.	$Fe^{23+} + H_2 \longrightarrow Fe^{24+}$	17
A20.	$Fe^{24+} + H_2 \longrightarrow Fe^{25+}$	17
A21.	$Fe^{25+} + H_2 \longrightarrow Fe^{26+}$	17
A22.	$Br^{3+} + H_2 \longrightarrow Br^{4+}$	6
A23.	$Br^{4+} + H_2 \longrightarrow Br^{5+}$	6, 9
A24.	$Br^{4+} + H_2 \longrightarrow Br^{6+}$	9

Fig. No.	Processes	References
A25.	$Br^{4+} + H_2 \longrightarrow Br^{7+}$	9
A26.	$Br^{4+} + H_2 \longrightarrow Br^{8+}$	9
A27.	$Br^{5+} + H_2 \longrightarrow Br^{6+}$	6, 9
A28.	$Br^{5+} + H_2 \longrightarrow Br^{7+}$	9
A29.	$Br^{6+} + H_2 \longrightarrow Br^{7+}$	6, 9
A30.	$Br^{6+} + H_2 \longrightarrow Br^{8+}$	9
A31.	$Br^{7+} + H_2 \longrightarrow Br^{8+}$	6, 9
A32.	$Br^{7+} + H_2 \longrightarrow Br^{9+}$	9
A33.	$Br^{8+} + H_2 \longrightarrow Br^{9+}$	6, 9
A34.	$Br^{8+} + H_2 \longrightarrow Br^{10+}$	9
A35.	$Br^{9+} + H_2 \longrightarrow Br^{10+}$	6
A36.	$Br^{10+} + H_2 \longrightarrow Br^{11+}$	6
A37.	$Br^{11+} + H_2 \longrightarrow Br^{12+}$	6
A38.	$I^{2+} + H_2 \longrightarrow I^{3+}$	11
A39.	$I^{2+} + H_2 \longrightarrow I^{4+}$	11
A40.	$I^{2+} + H_2 \longrightarrow I^{5+}$	11
A41.	$I^{3+} + H_2 \longrightarrow I^{4+}$	11
A42.	$I^{3+} + H_2 \longrightarrow I^{5+}$	11
A43.	$I^{3+} + H_2 \longrightarrow I^{6+}$	11
A44.	$I^{4+} + H_2 \longrightarrow I^{5+}$	11
A45.	$I^{4+} + H_2 \longrightarrow I^{6+}$	11
A46.	$I^{4+} + H_2 \longrightarrow I^{7+}$	11
A47.	$I^{5+} + H_2 \longrightarrow I^{6+}$	8, 11
A48.	$I^{5+} + H_2 \longrightarrow I^{7+}$	8, 11
A49.	$I^{5+} + H_2 \longrightarrow I^{8+}$	11

Fig. No.	Processes	References
A50.	$I^{6+} + H_2 \longrightarrow I^{7+}$	11
A51.	$I^{6+} + H_2 \longrightarrow I^{8+}$	11
A52.	$I^{6+} + H_2 \longrightarrow I^{9+}$	11
A53.	$I^{7+} + H_2 \longrightarrow I^{8+}$	11
A54.	$I^{7+} + H_2 \longrightarrow I^{9+}$	11
A55.	$I^{8+} + H_2 \longrightarrow I^{9+}$	11
A56.	$I^{8+} + H_2 \longrightarrow I^{10+}$	11
A57.	$I^{9+} + H_2 \longrightarrow I^{10+}$	11
A58.	$I^{9+} + H_2 \longrightarrow I^{11+}$	11
A59.	$I^{10+} + H_2 \longrightarrow I^{11+}$	11

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III. GRAPHS

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

Fig. 1 $Li^{+} + H_2 \rightarrow Li$

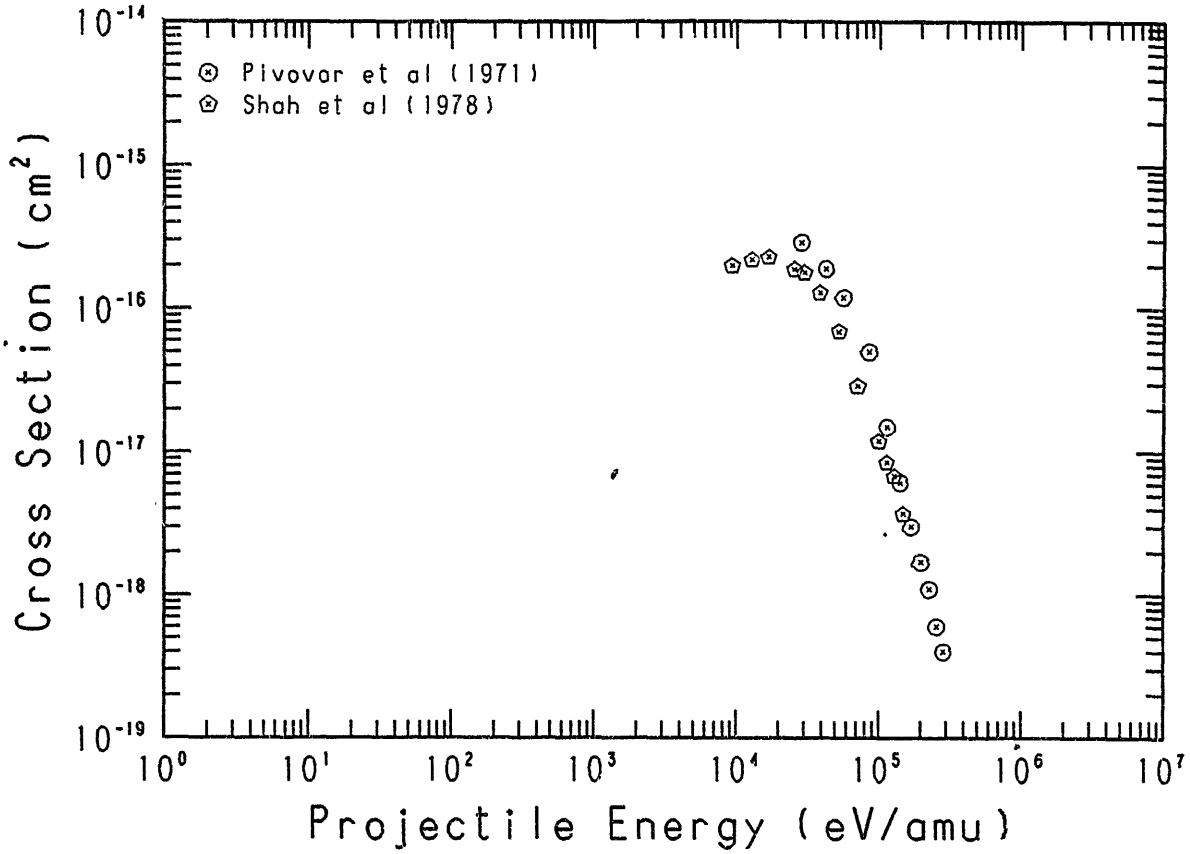


Fig. 2 $Li^{+2} + H_2 \rightarrow Li^{+}$

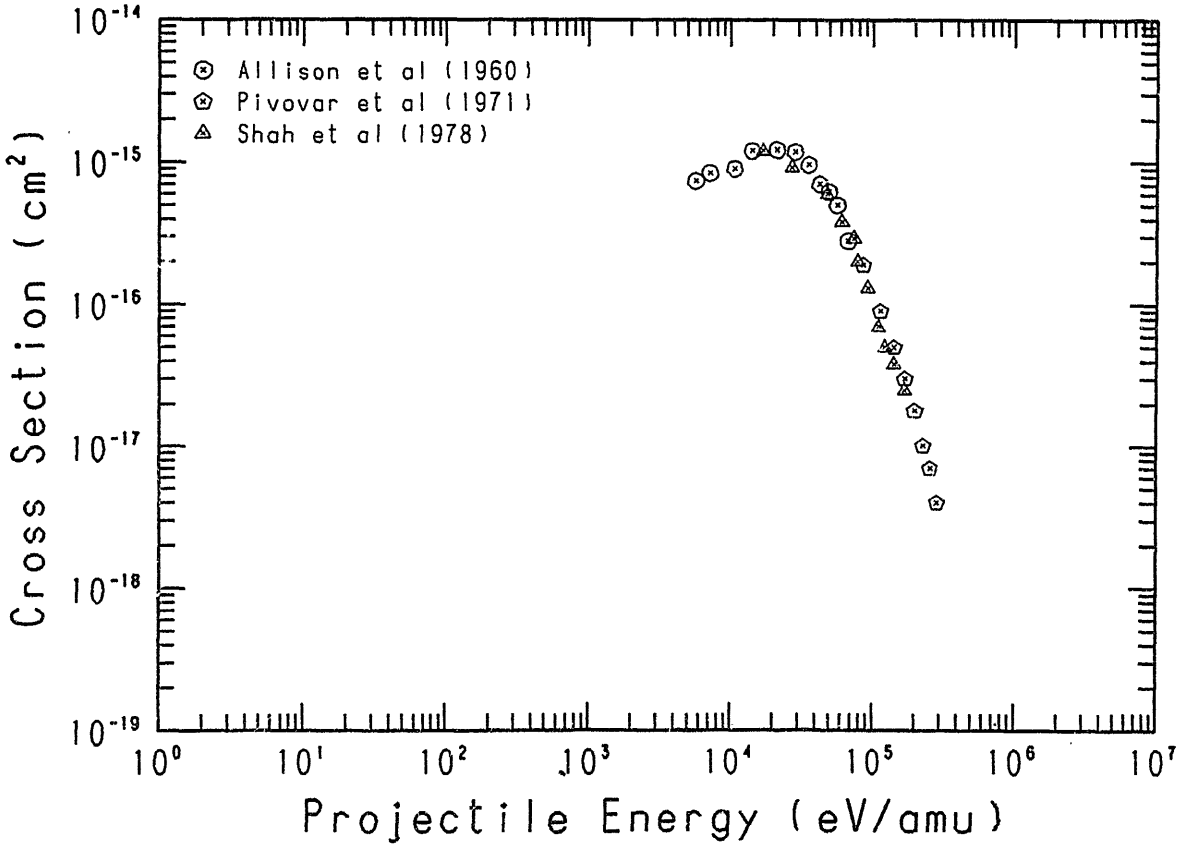


Fig. 3 $Li^{3+} + H_2 \rightarrow Li^{2+}$

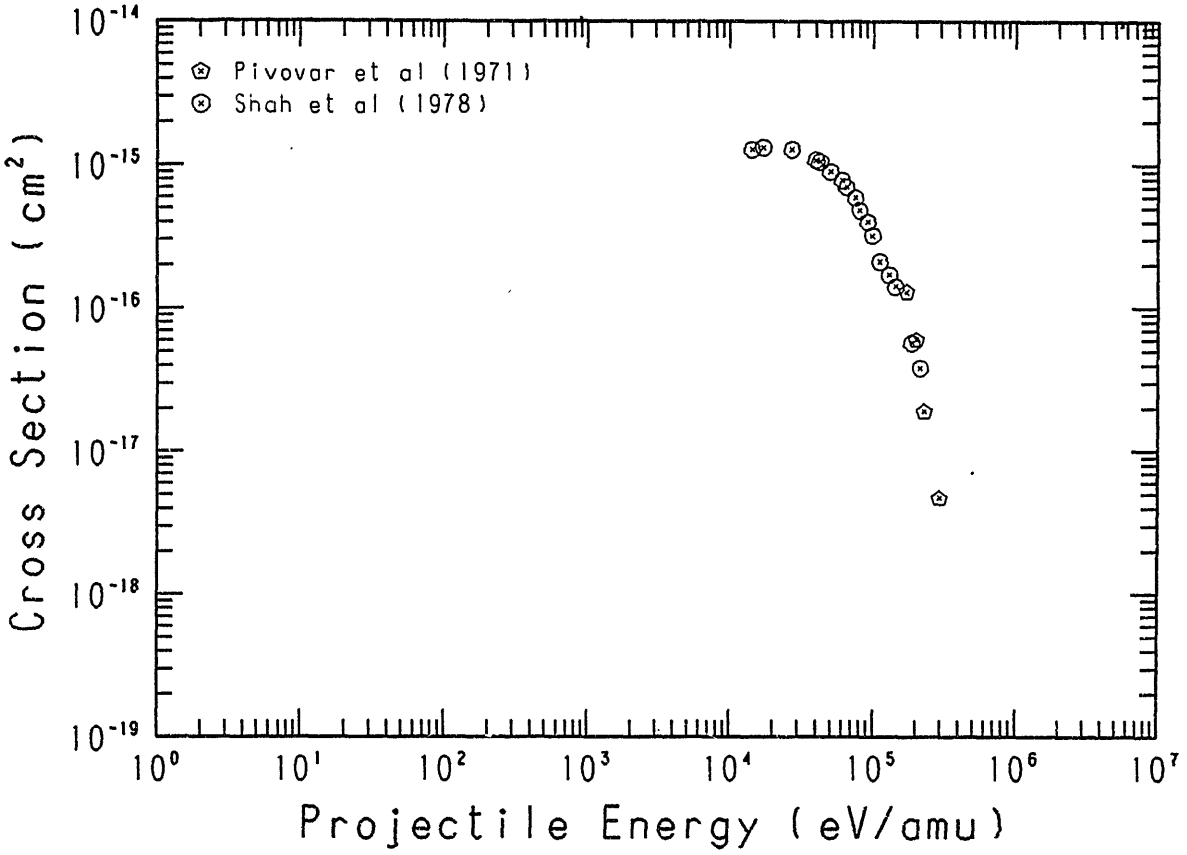


Fig. 4 $B^{+} + H_2 \rightarrow B$

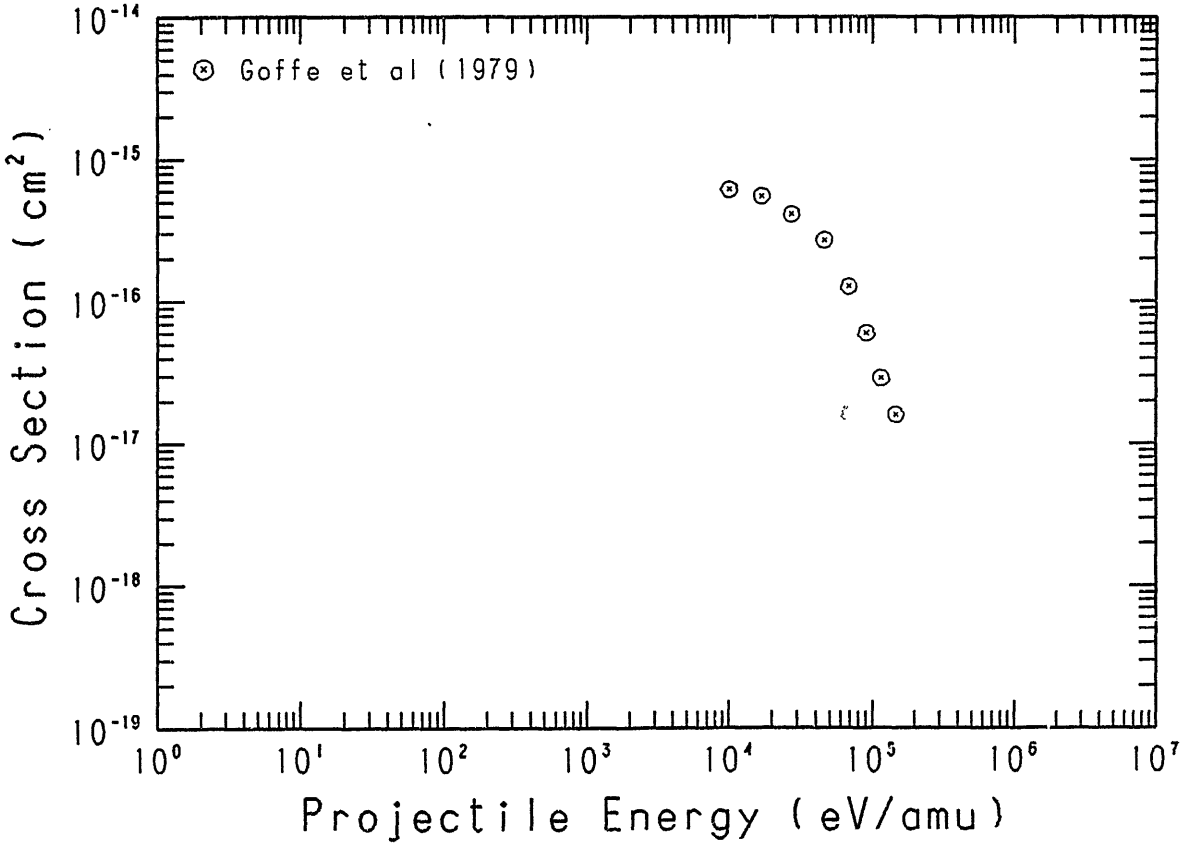


Fig. 5 $B^{2+} + H_2 \rightarrow B^+$

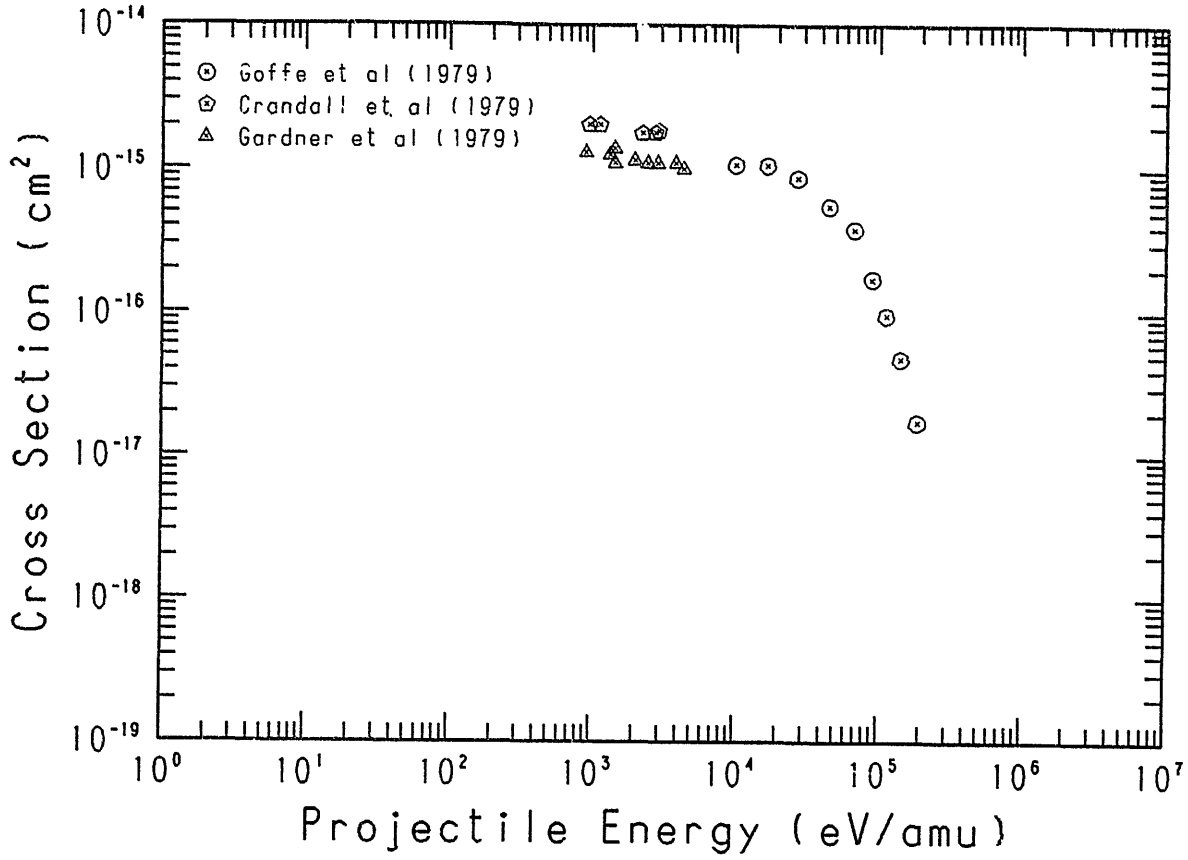


Fig. 6 $B^{3+} + H_2 \rightarrow B^+$

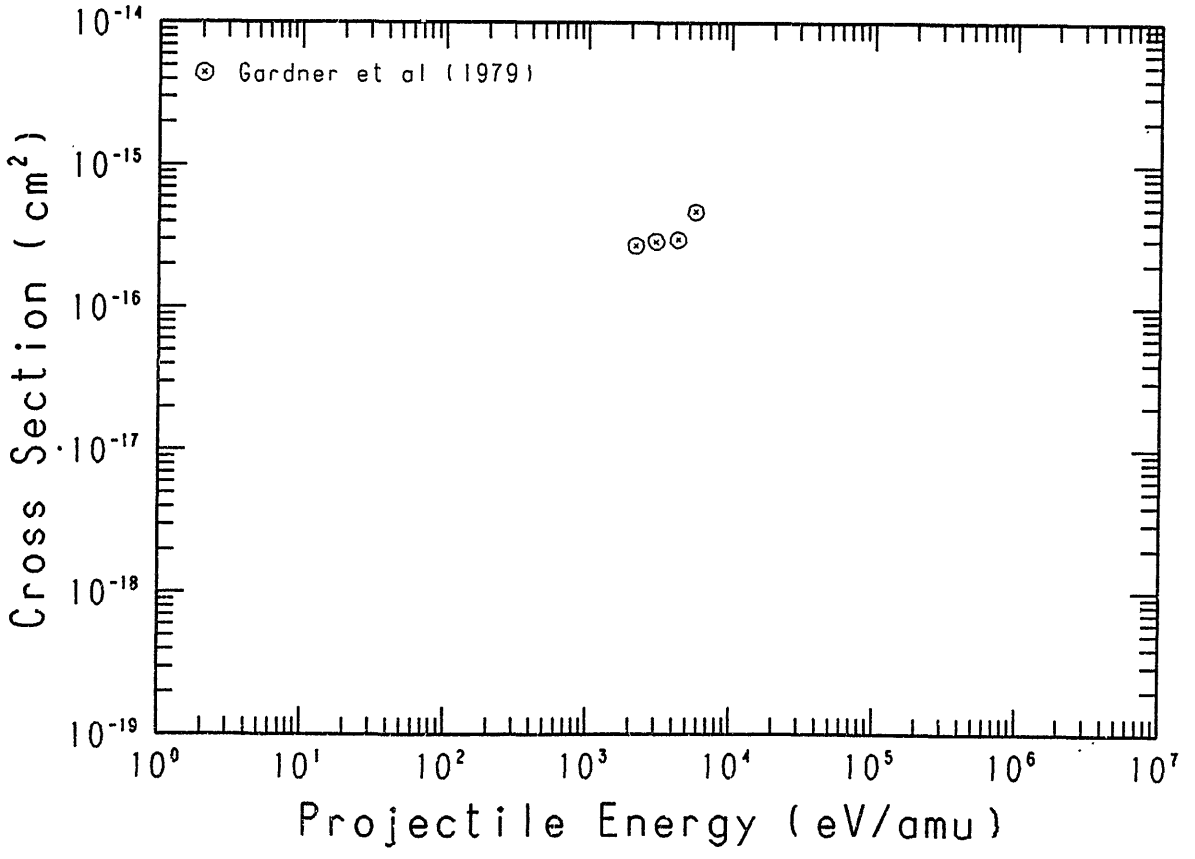


Fig. 7 $B^{3+} + H_2 \rightarrow B^{2+}$

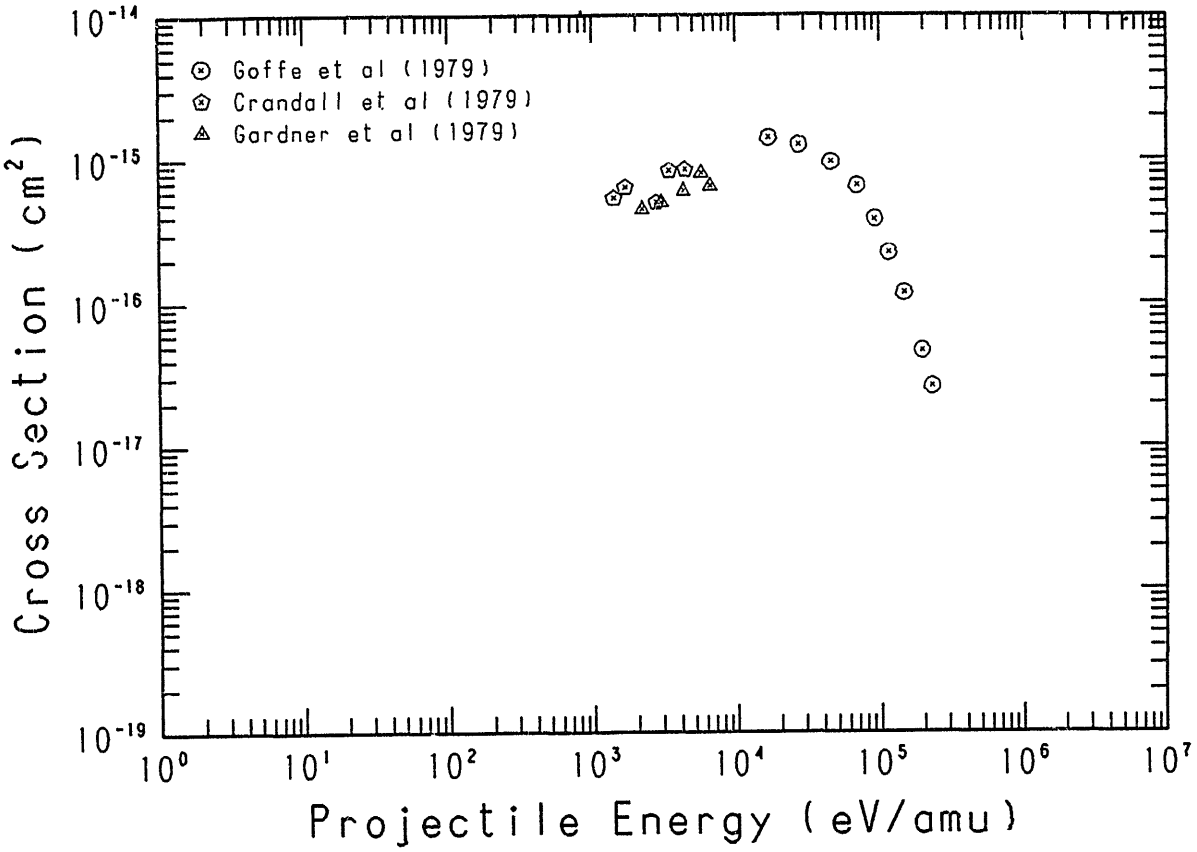


Fig. 8 $B^{4+} + H_2 \rightarrow B^{2+}$

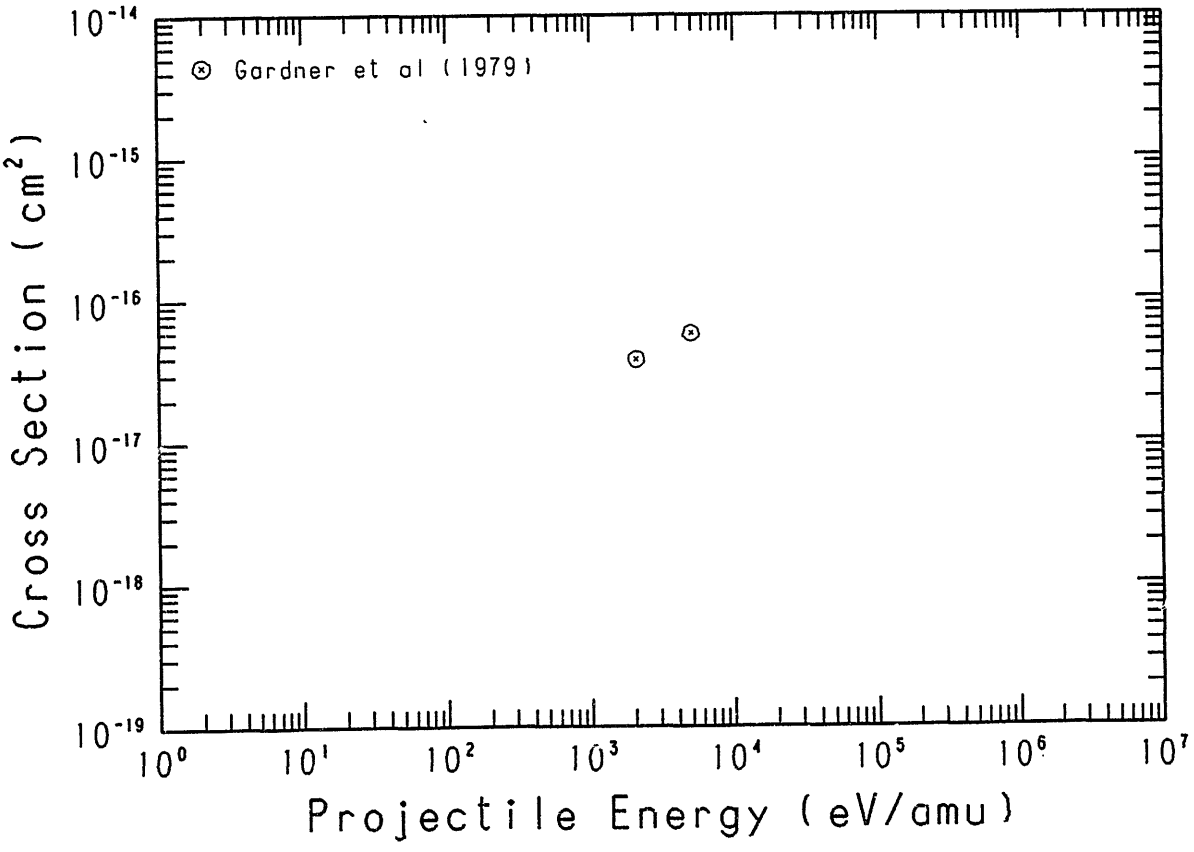


Fig. 9 $B^{4+} + H_2 \rightarrow B^{3+}$

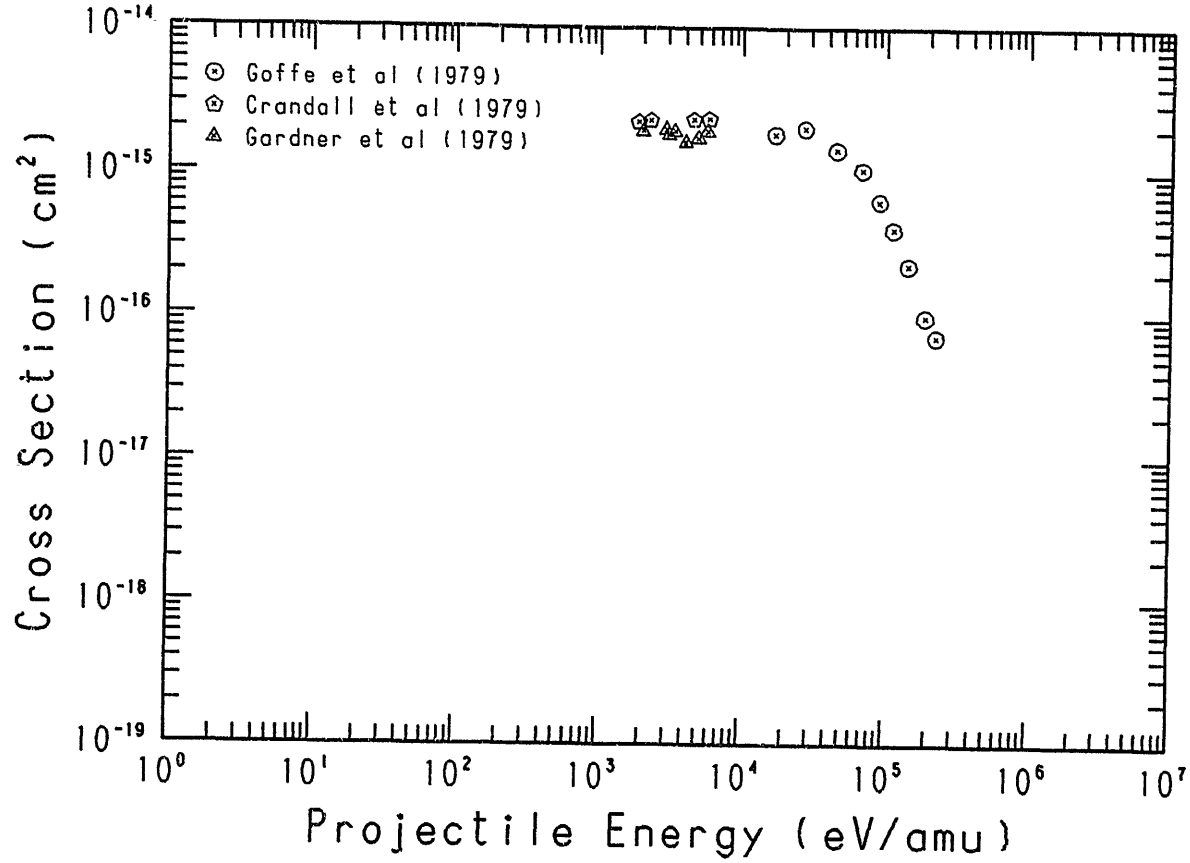


Fig. 10 $B^{5+} + H_2 \rightarrow B^{4+}$

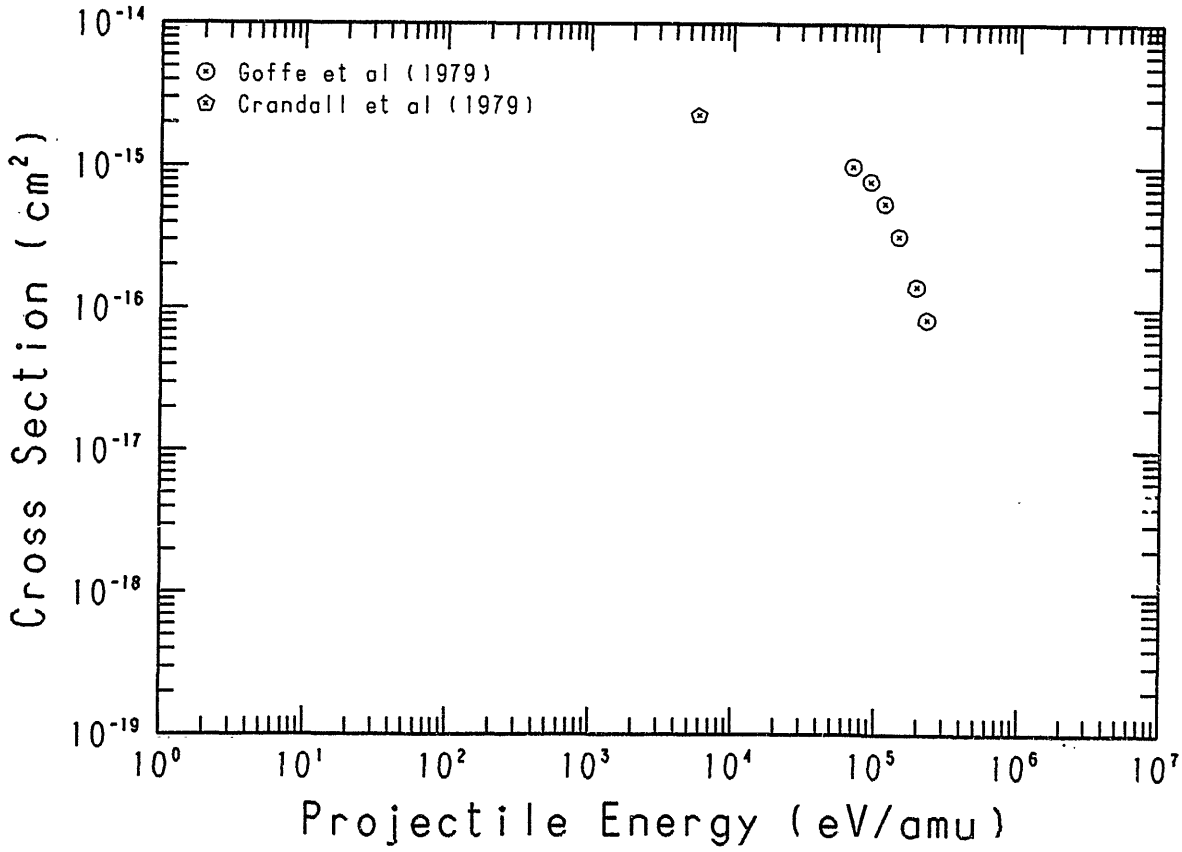


Fig. 11 $C^+ + H_2 \rightarrow C$

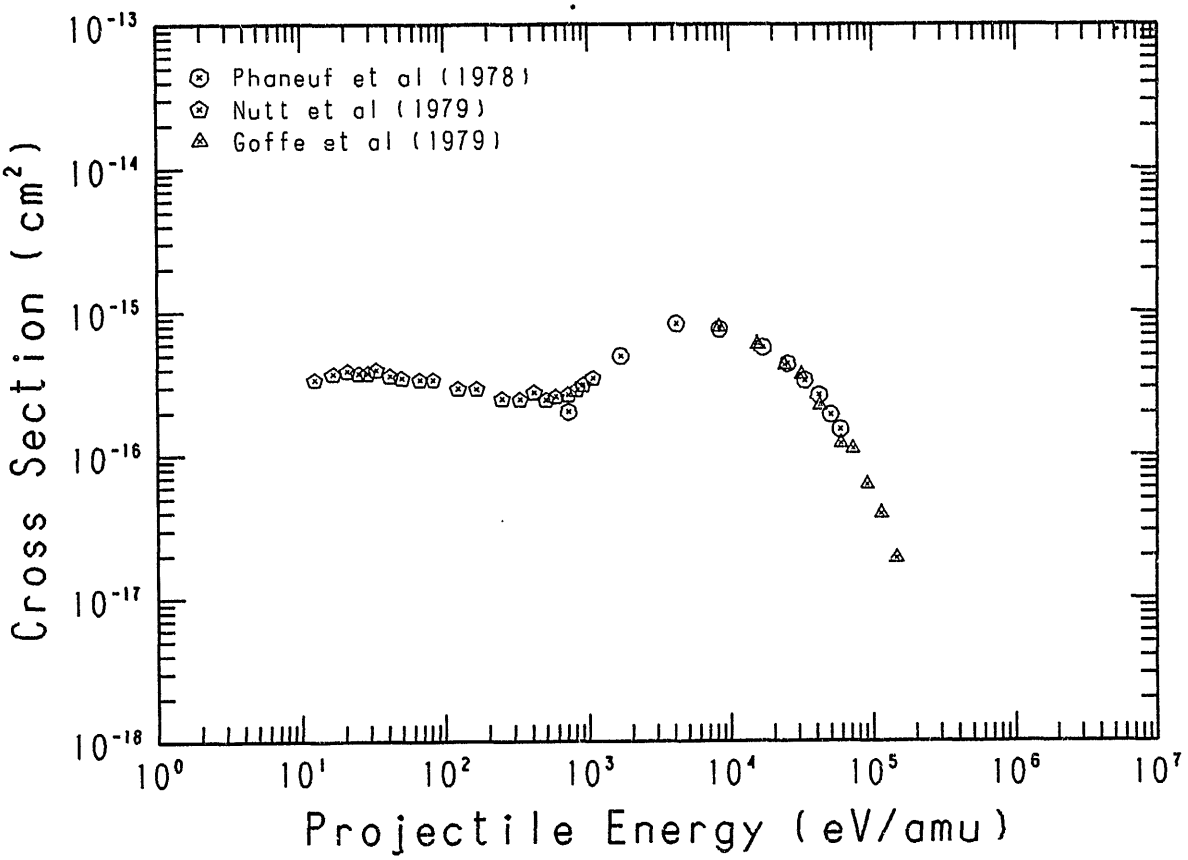


Fig. 12 $C^{2+} + H_2 \rightarrow C^+$

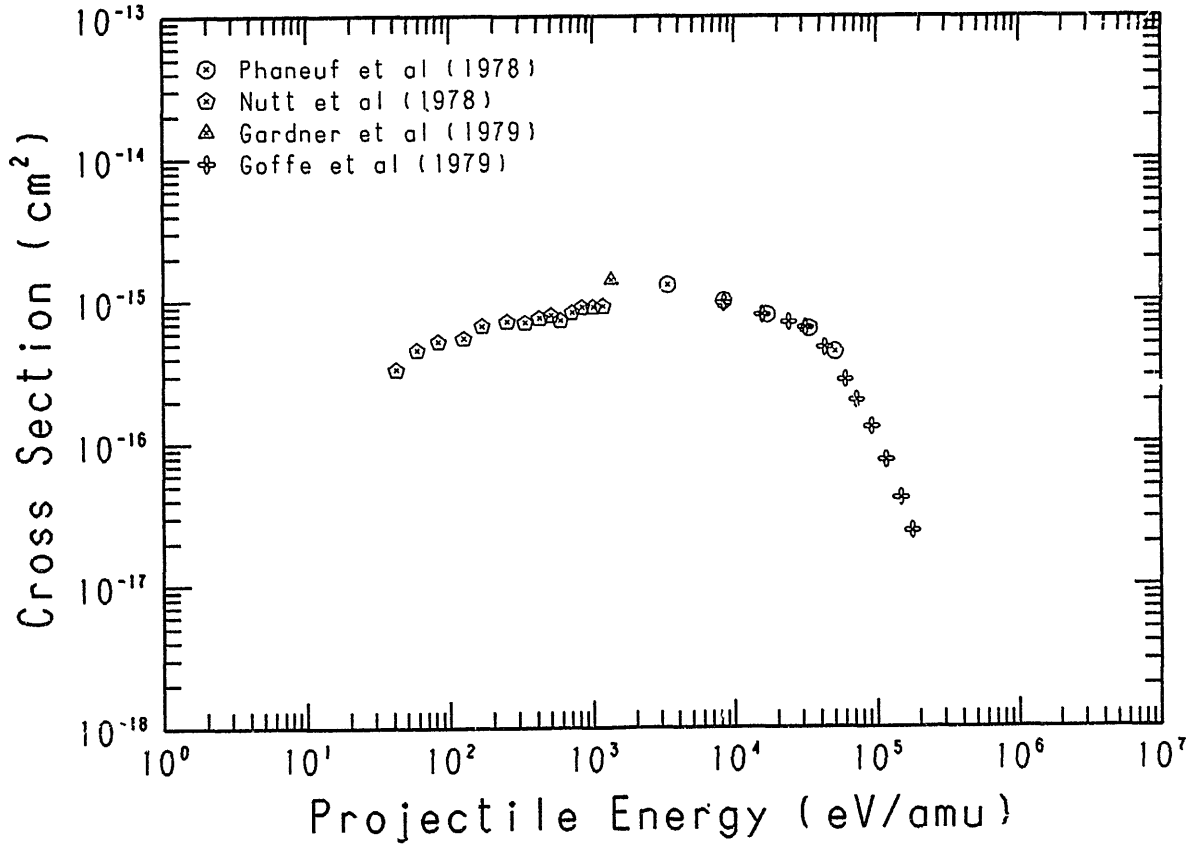


Fig. 13 $C^{3+} + H_2 \rightarrow C^{2+}$

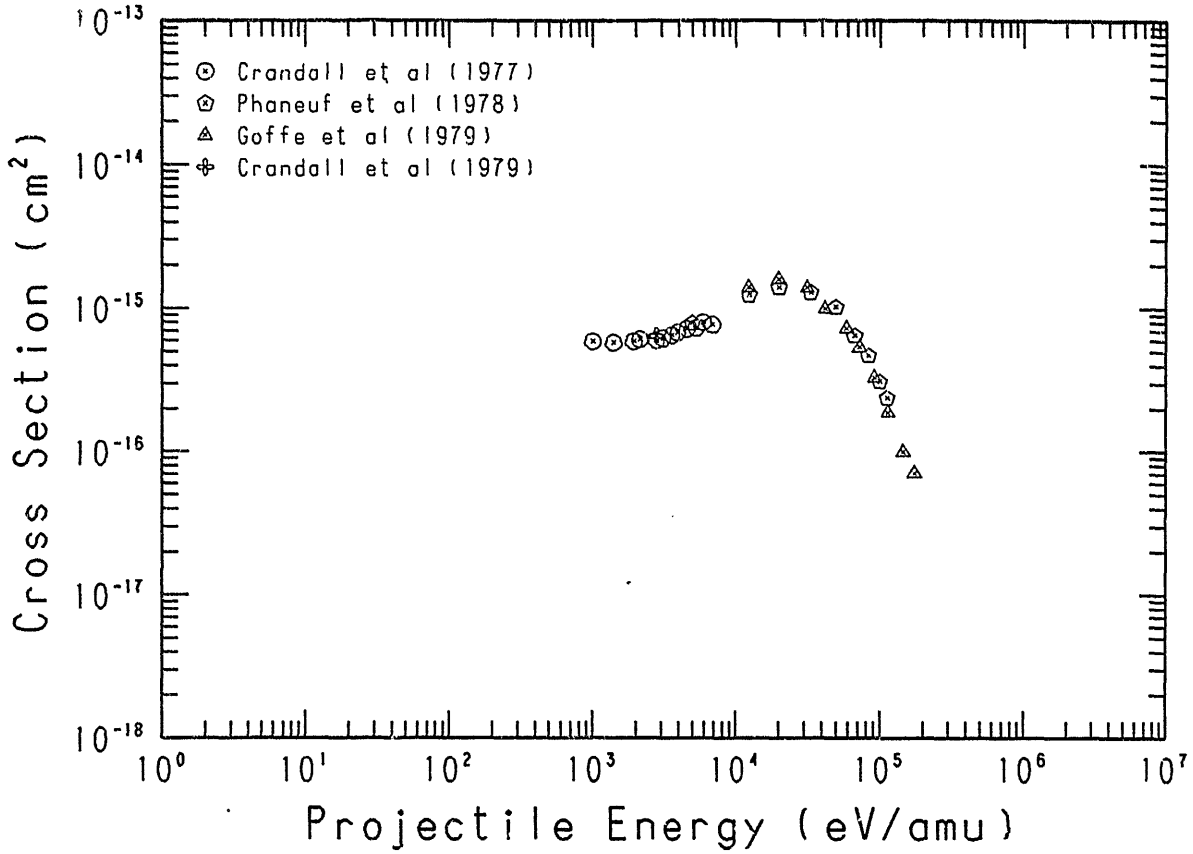


Fig. 14 $C^{4+} + H_2 \rightarrow C^{2+}$

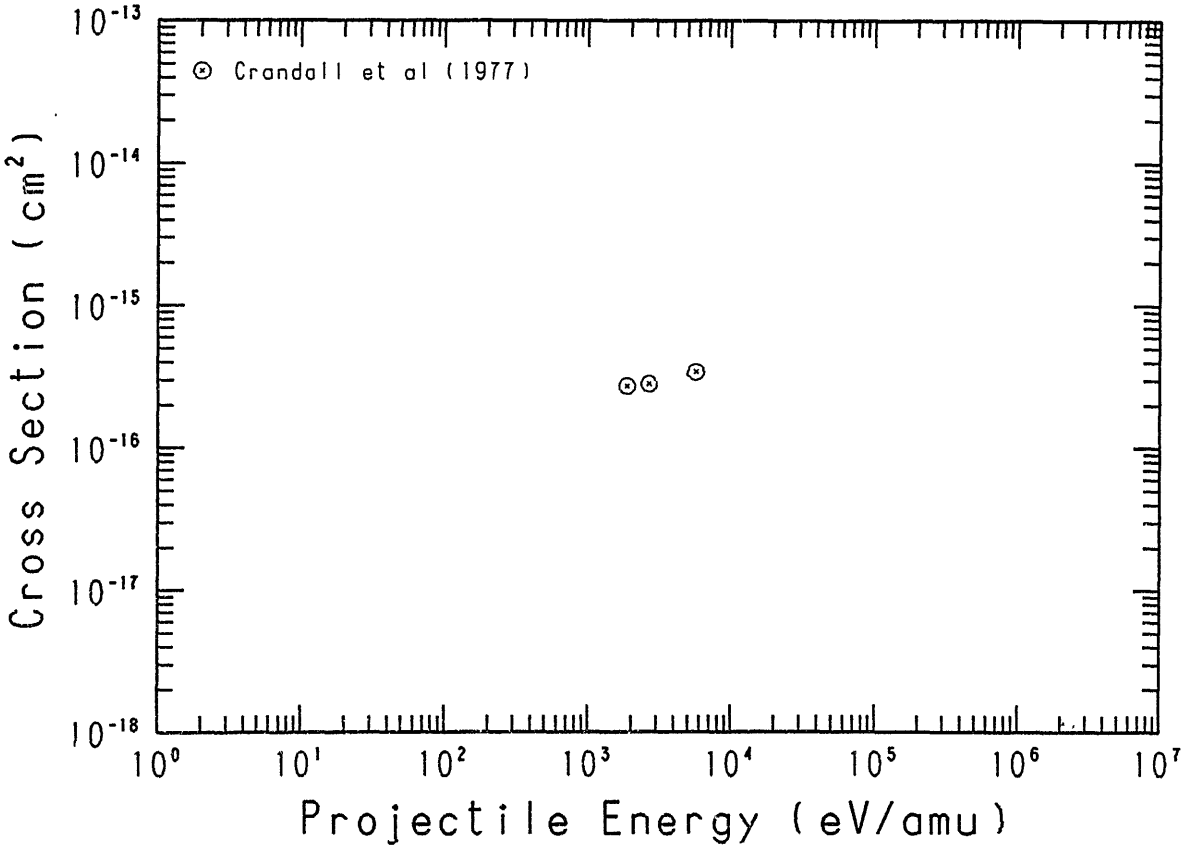


Fig. 15 $C^{4+} + H_2 \rightarrow C^{3+}$

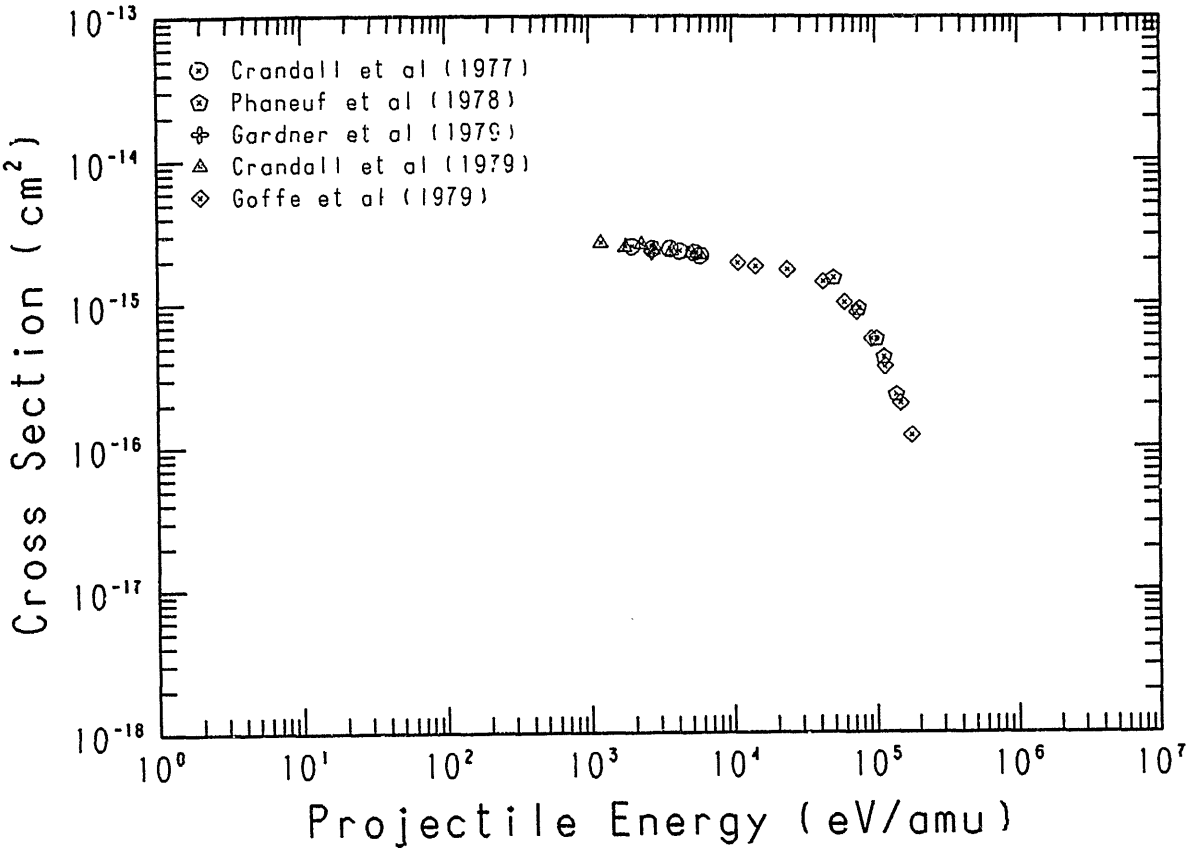


Fig. 16 $C^{5+} + H_2 \rightarrow C^{4+}$

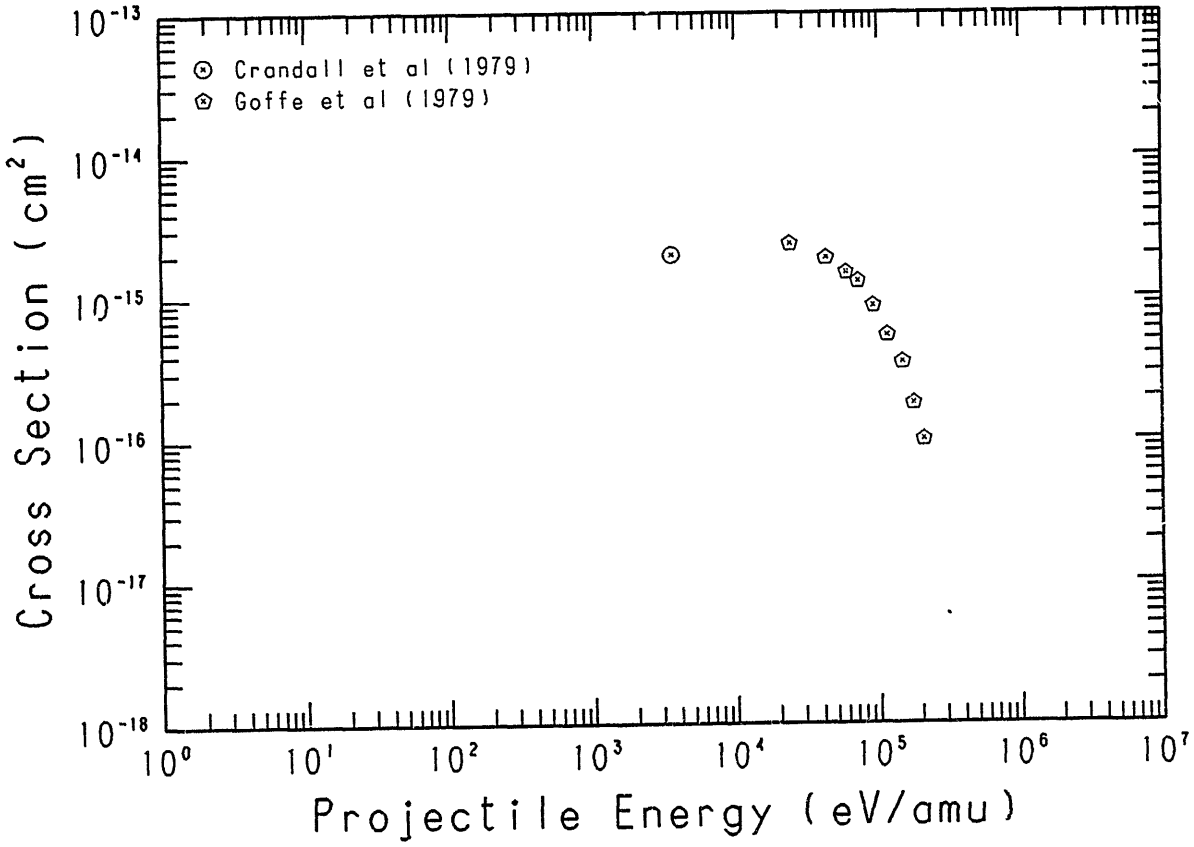


Fig. 17 $C^{6+} + H_2 \rightarrow C^{5+}$

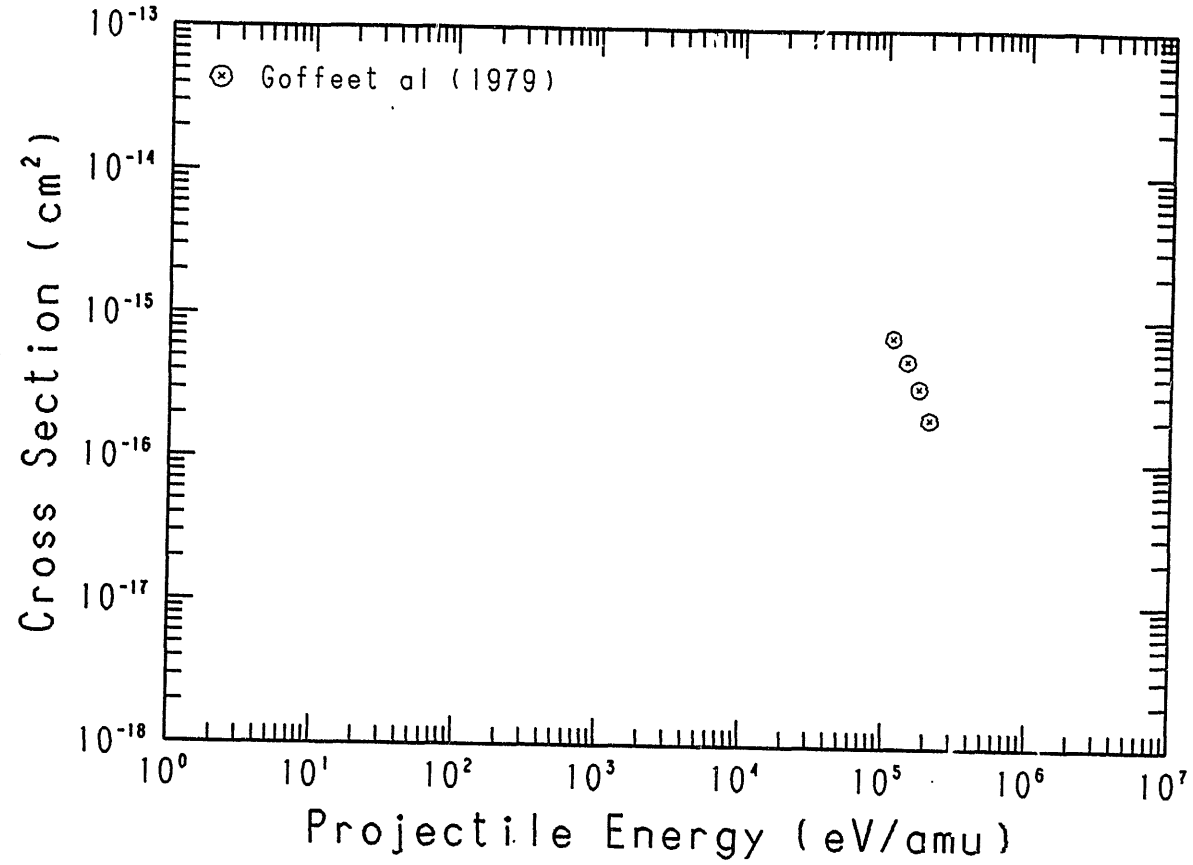


Fig. 18 $N^{+} + H_2 \rightarrow N$

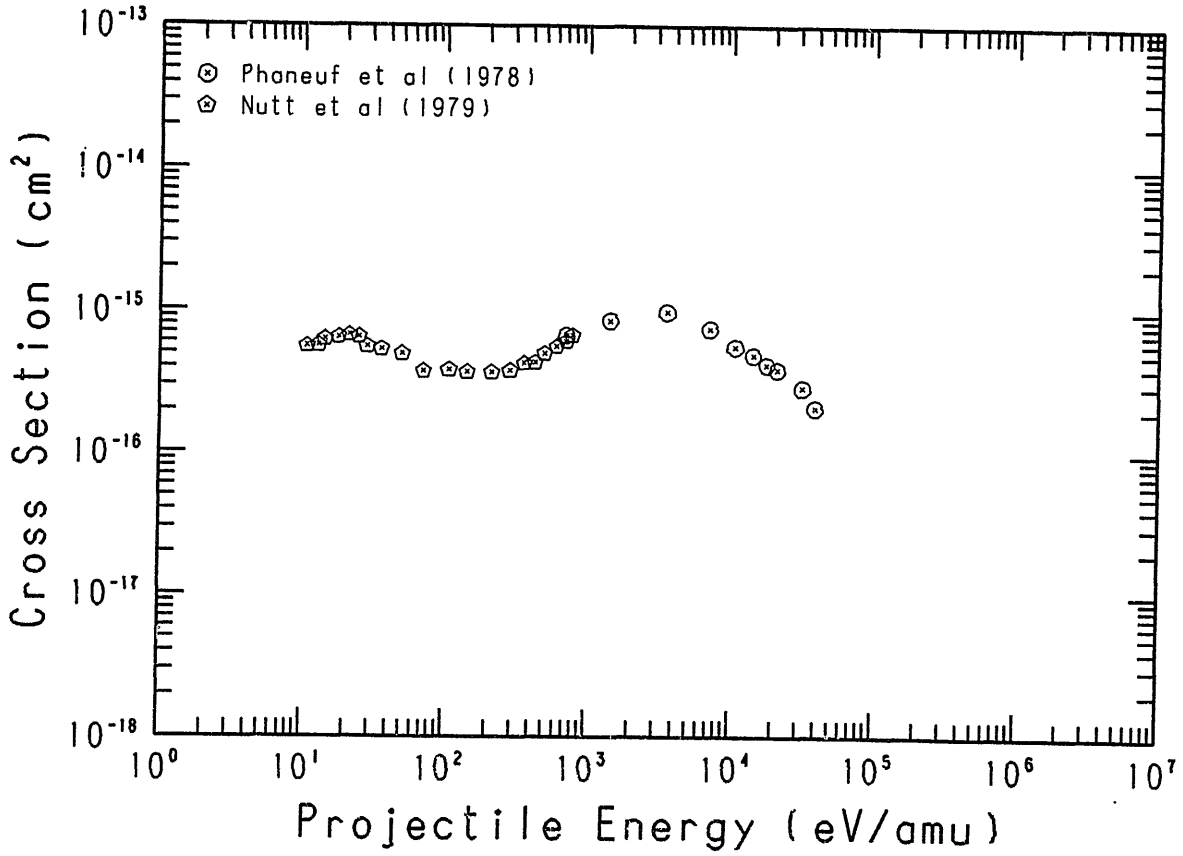


Fig. 19 $N^{2+} + H_2 \rightarrow N^+$

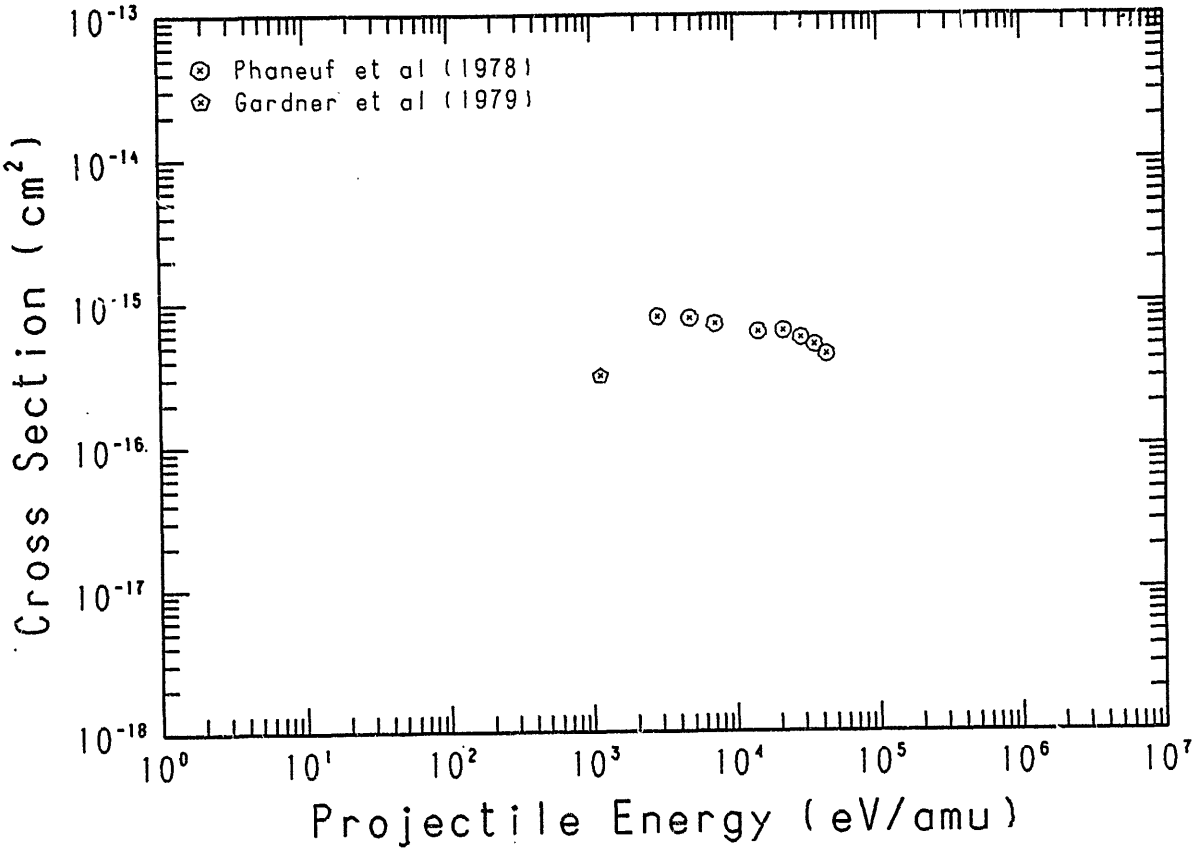


Fig. 20 $N^{3+} + H_2 \rightarrow N^{2+}$

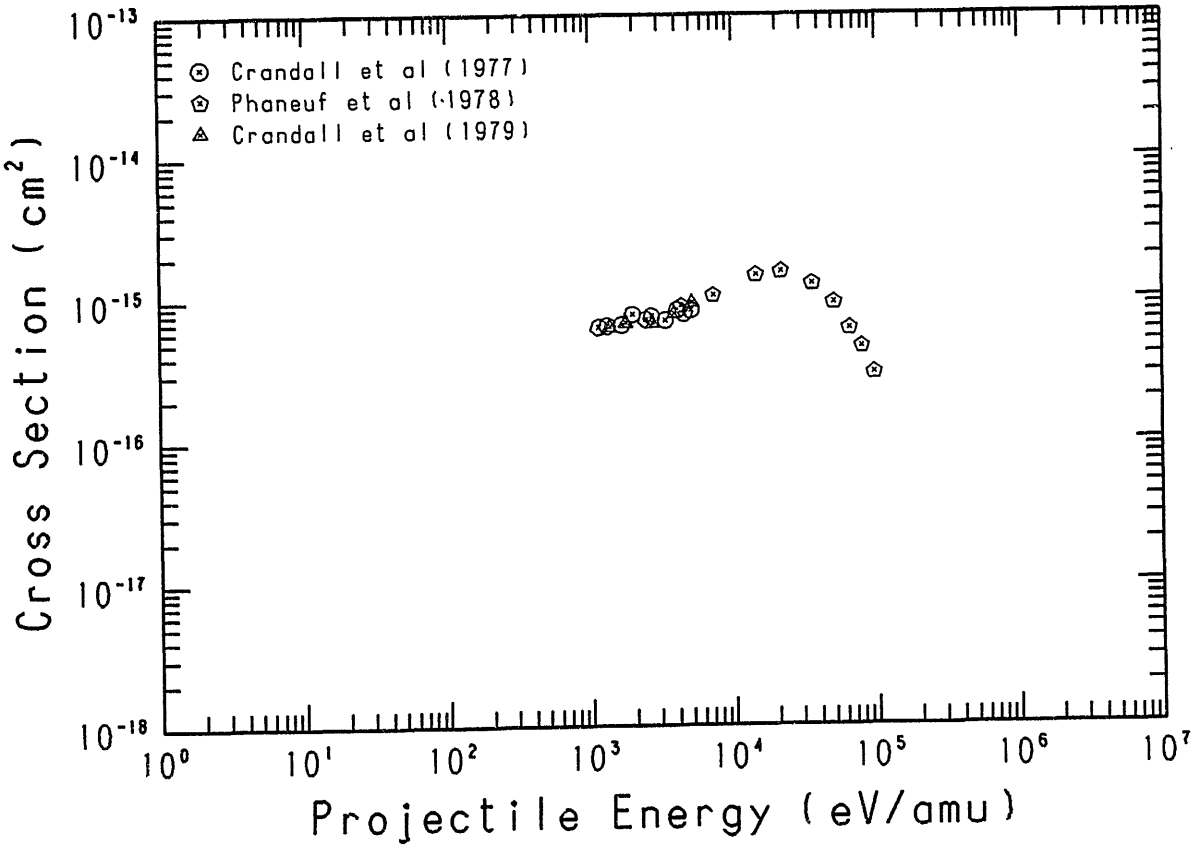


Fig. 21 $N^{4+} + H_2 \rightarrow N^{3+}$

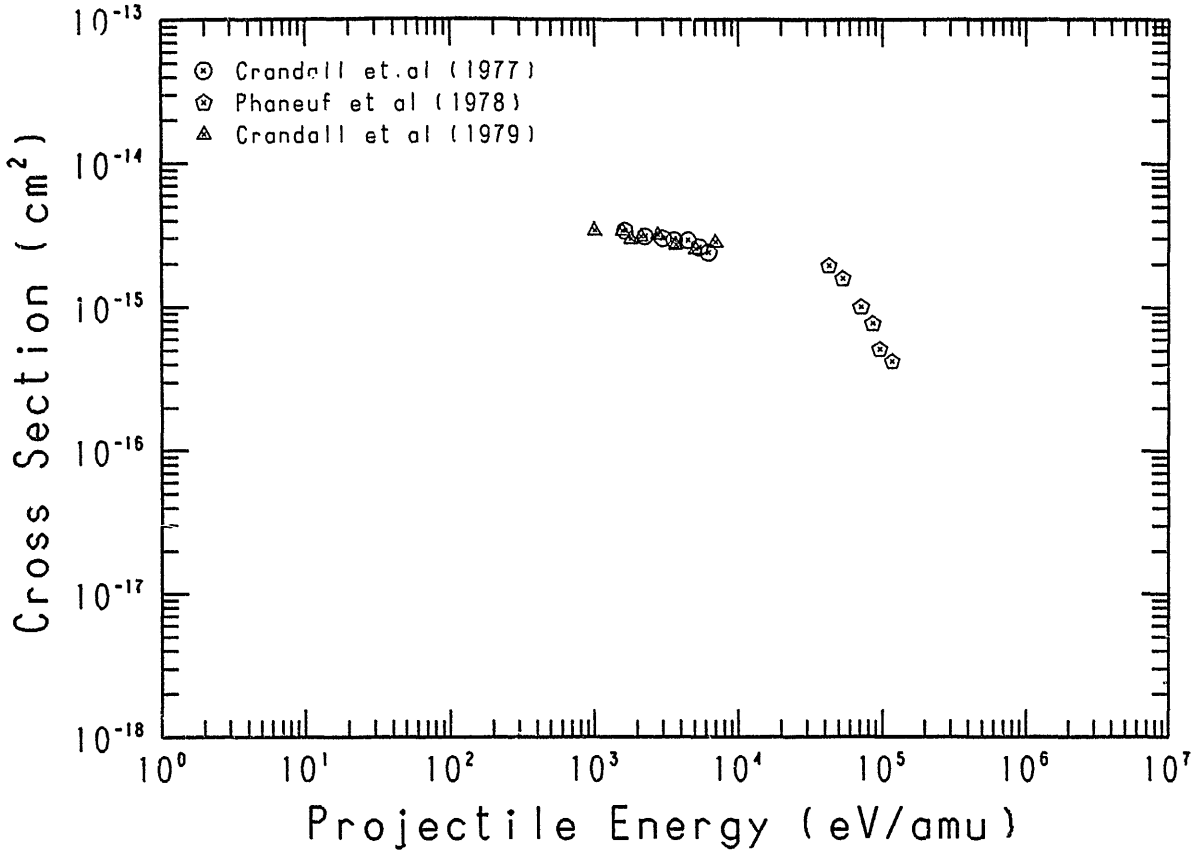


Fig. 22 $N^{5+} + H_2 \rightarrow N^{3+}$

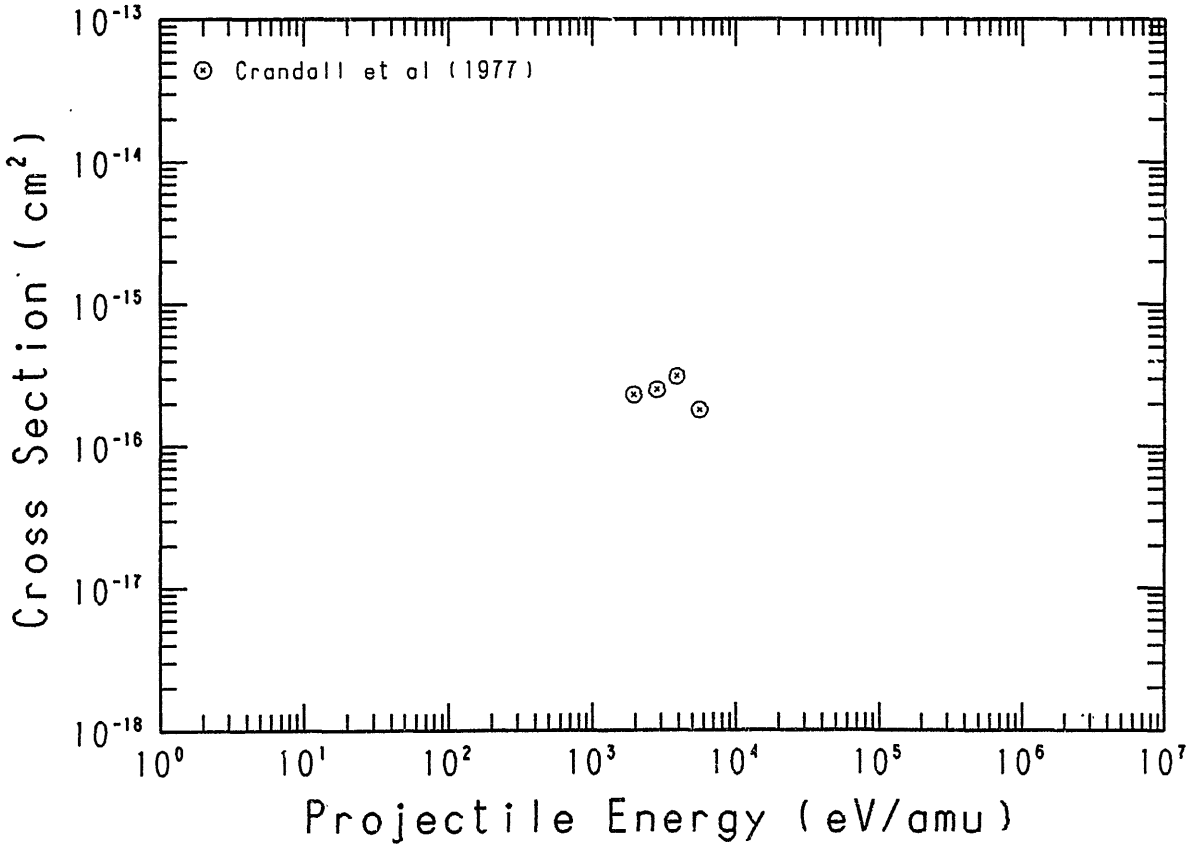


Fig. 23 $N^{5+} + H_2 \rightarrow N^{4+}$

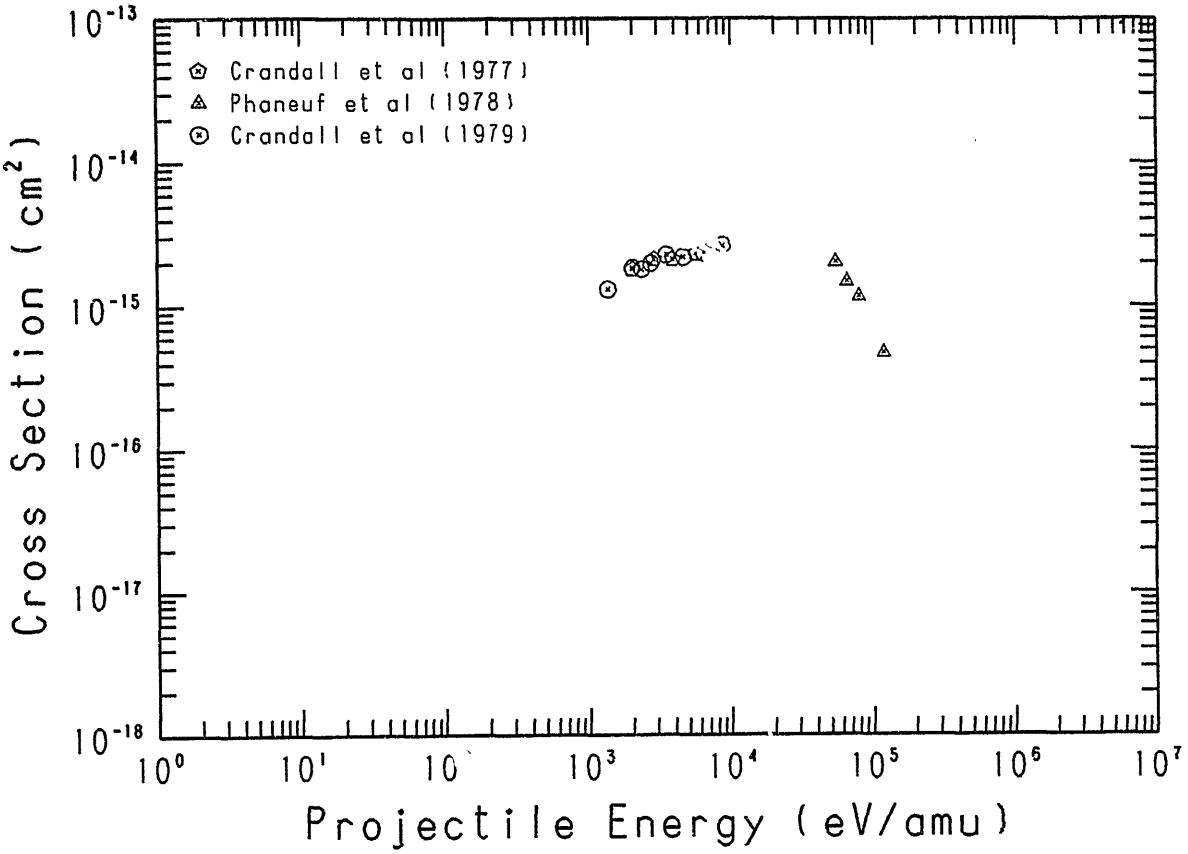


Fig. 24 $O^{+} + H_2 \rightarrow O$

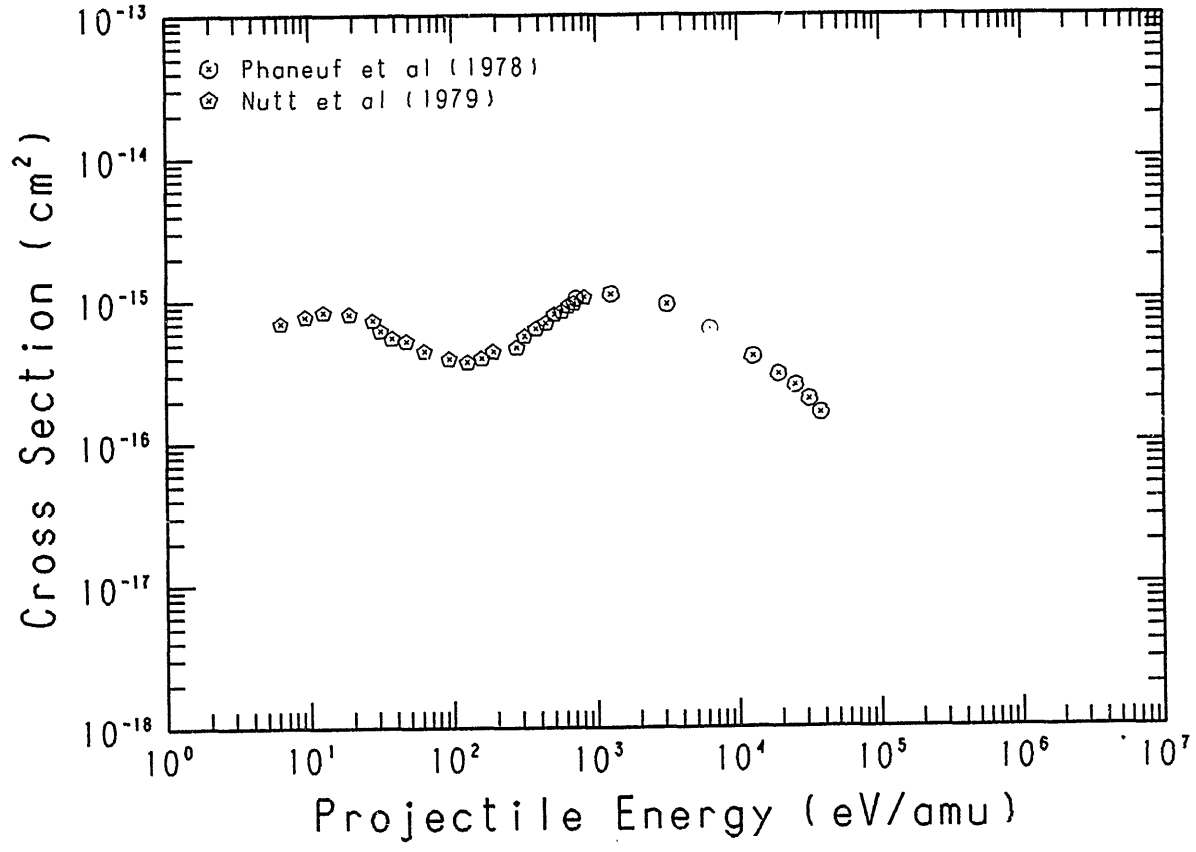


Fig. 25 $O^{2+} + H_2 \rightarrow O$

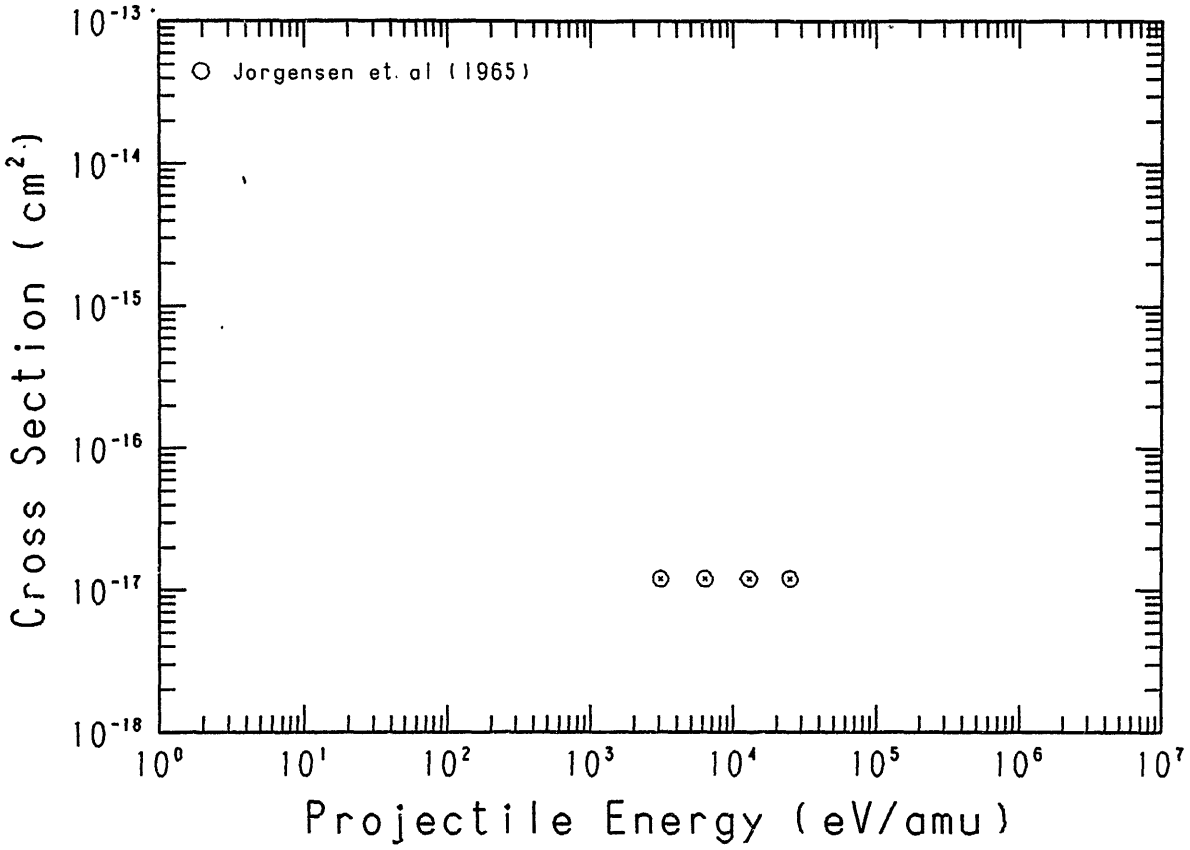


Fig. 26 $O^{2+} + H_2 \rightarrow O^+$

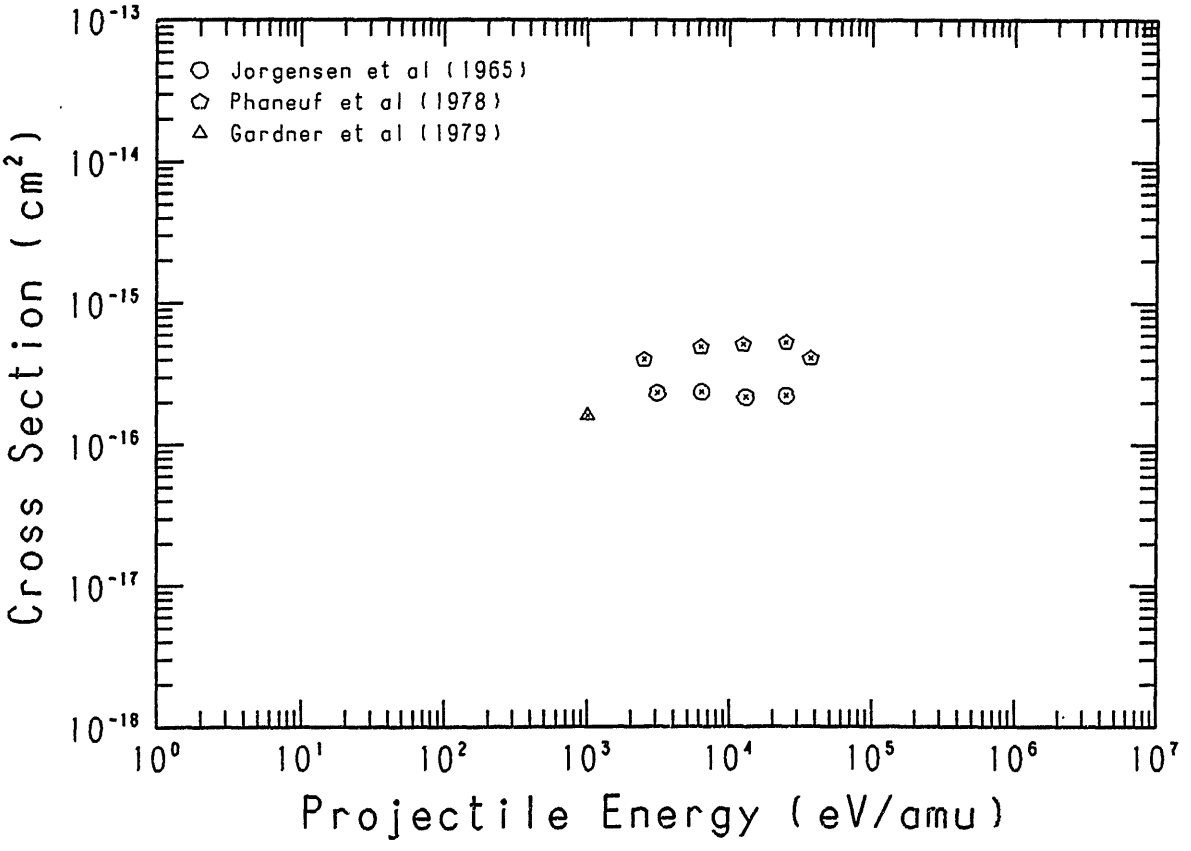


Fig. 27 $O^{3+} + H_2 \rightarrow O^{2+}$

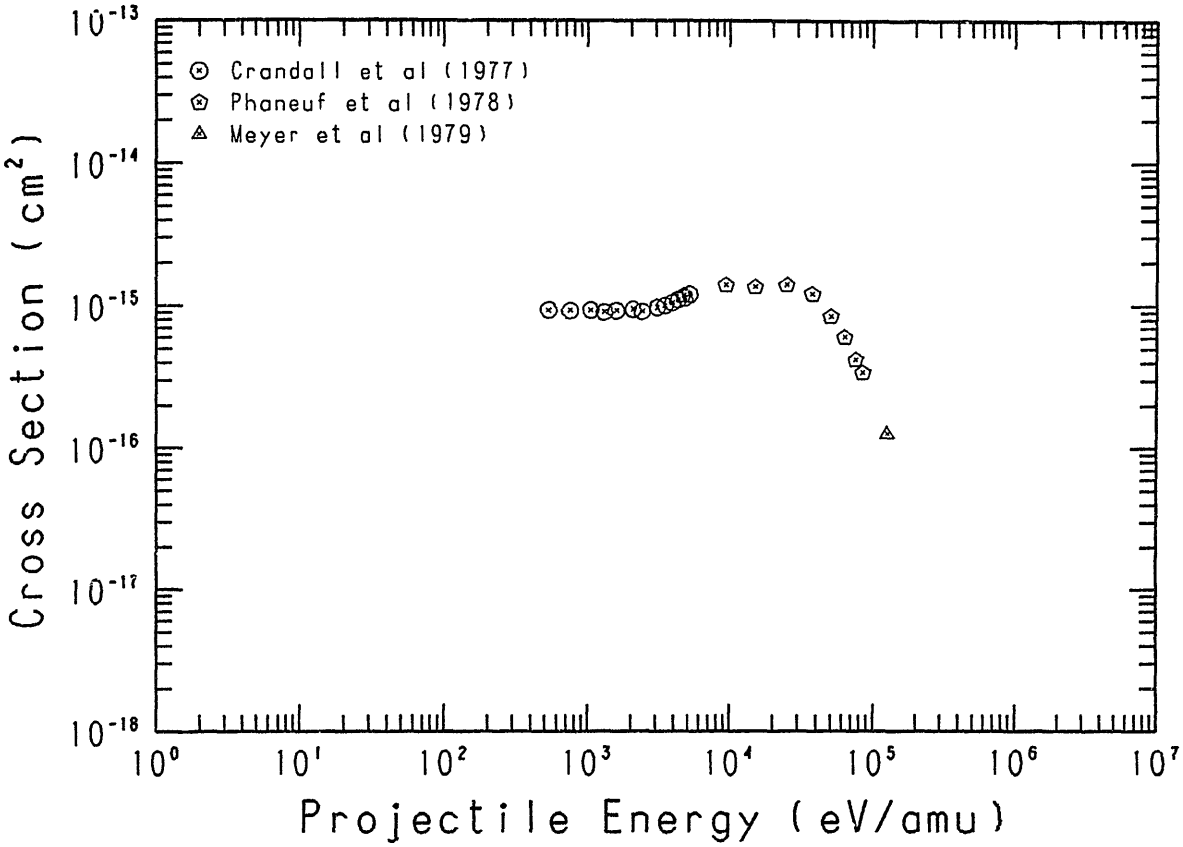


Fig. 28 $O^{4+} + H_2 \rightarrow O^{3+}$

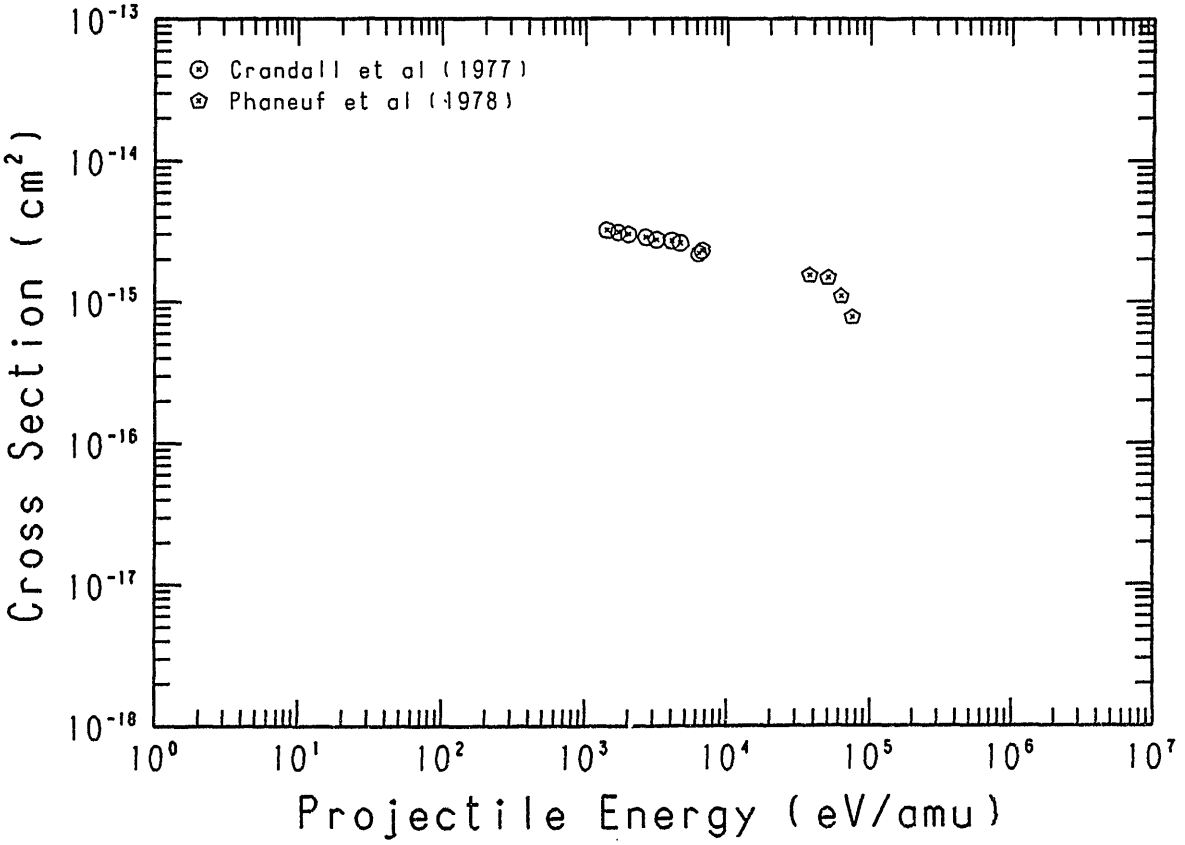


Fig. 29 $O^{5+} + H_2 \rightarrow O^{3+}$

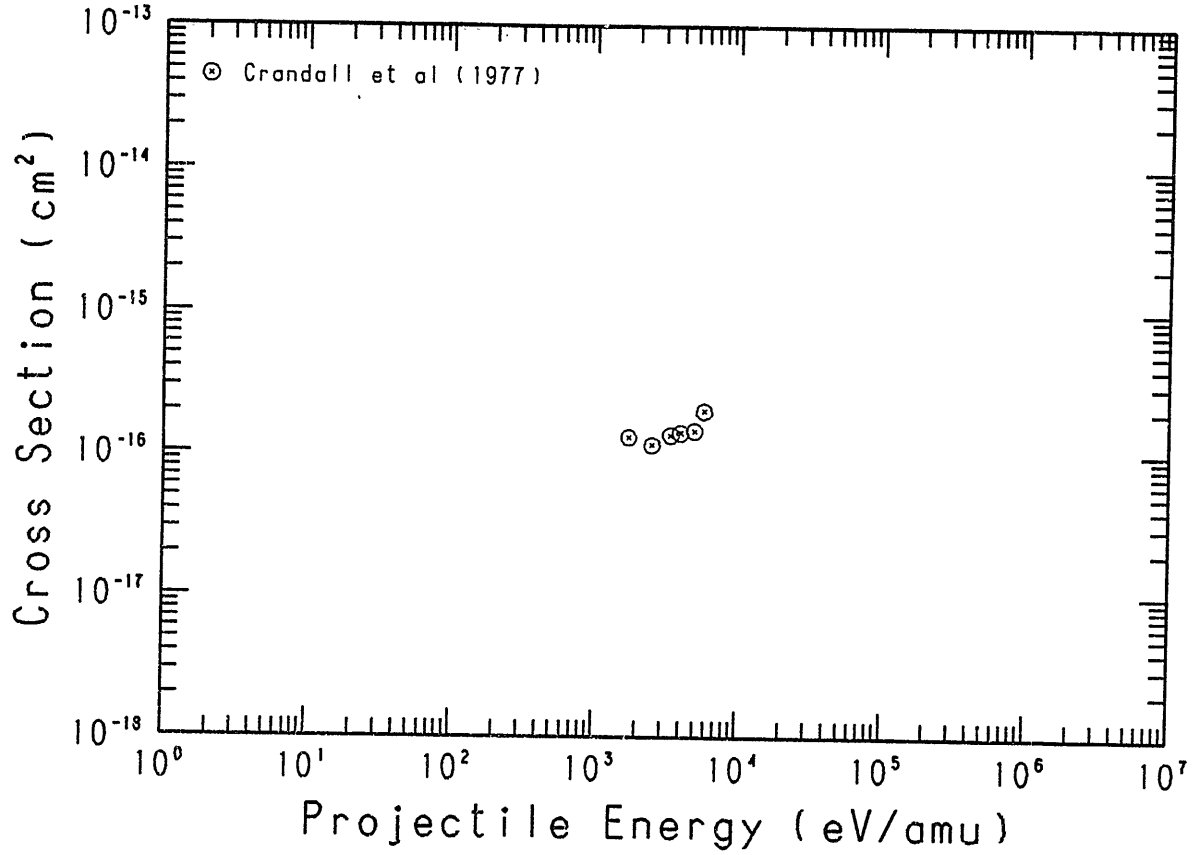


Fig. 30 $O^{5+} + H_2 \rightarrow O^{4+}$

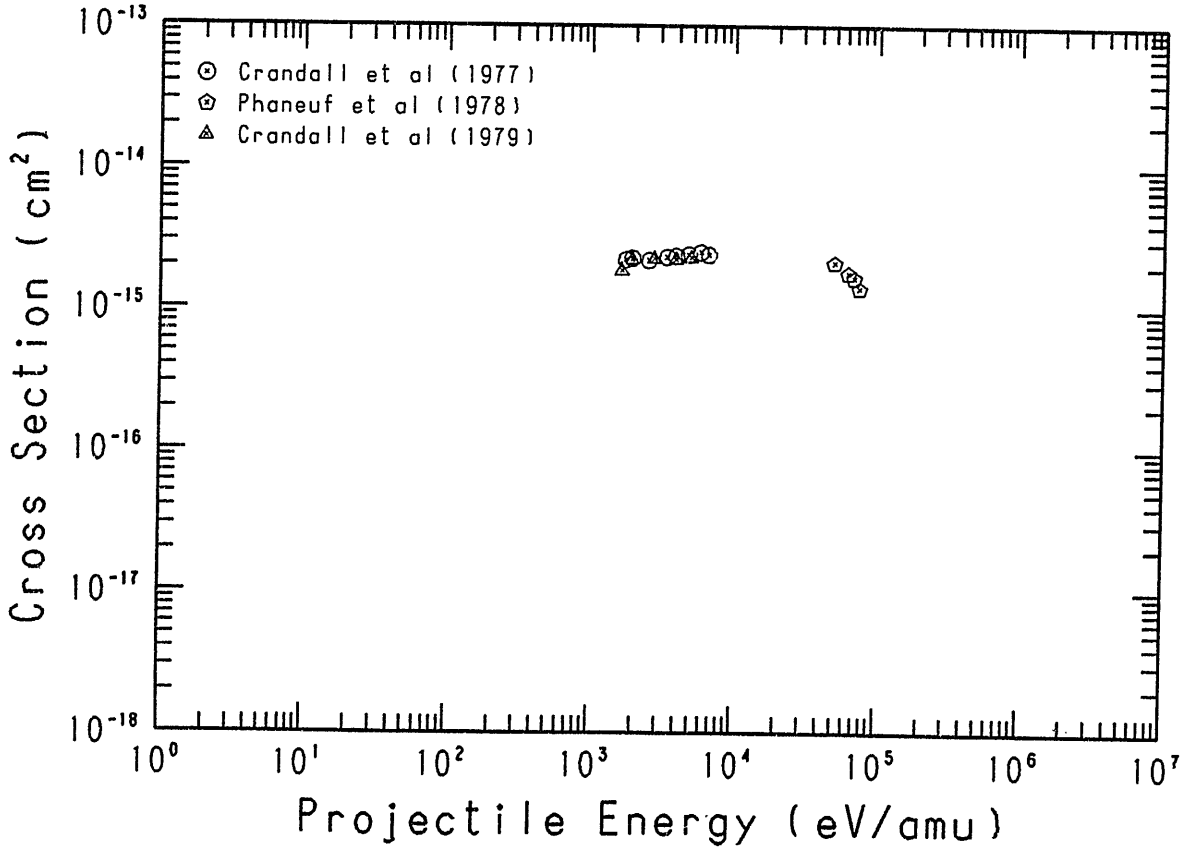


Fig. 31 $O^{6+} + H_2 \rightarrow O^{4+}$

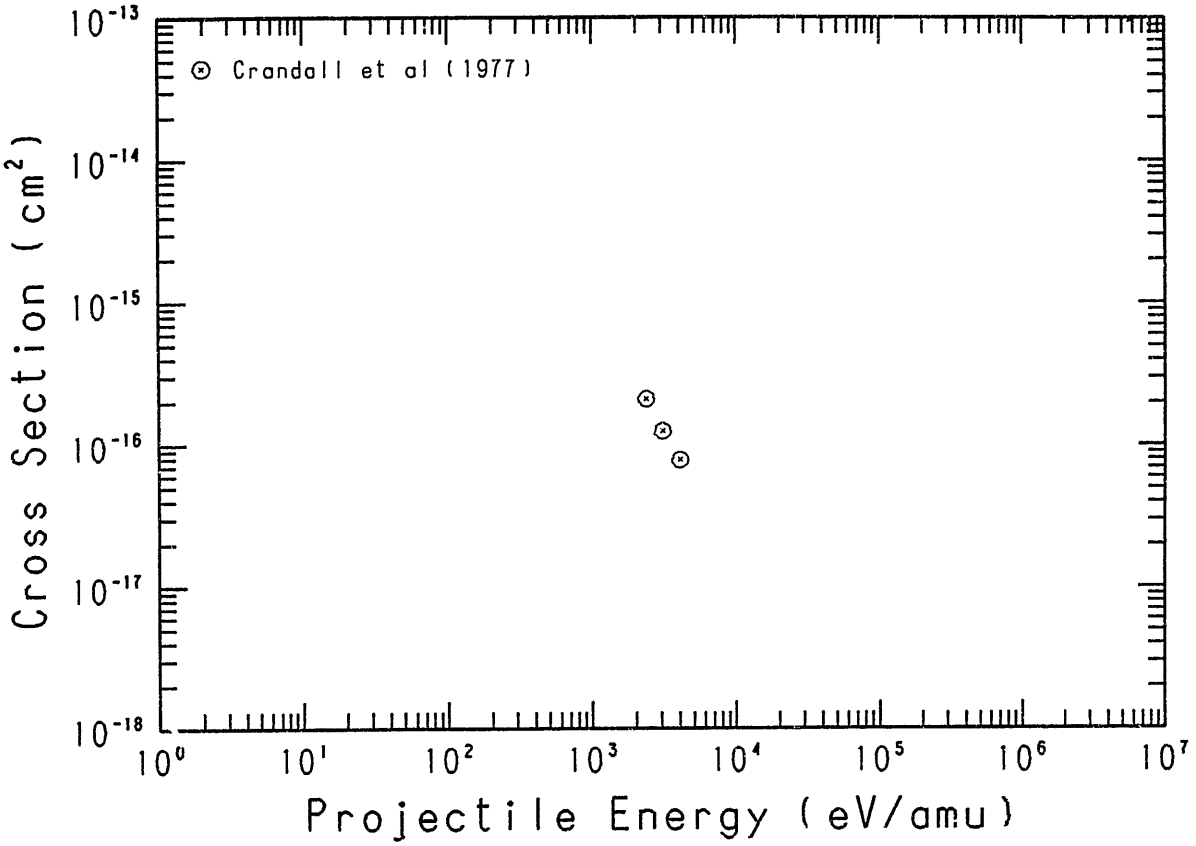


Fig. 32 $O^{6+} + H_2 \rightarrow O^{5+}$

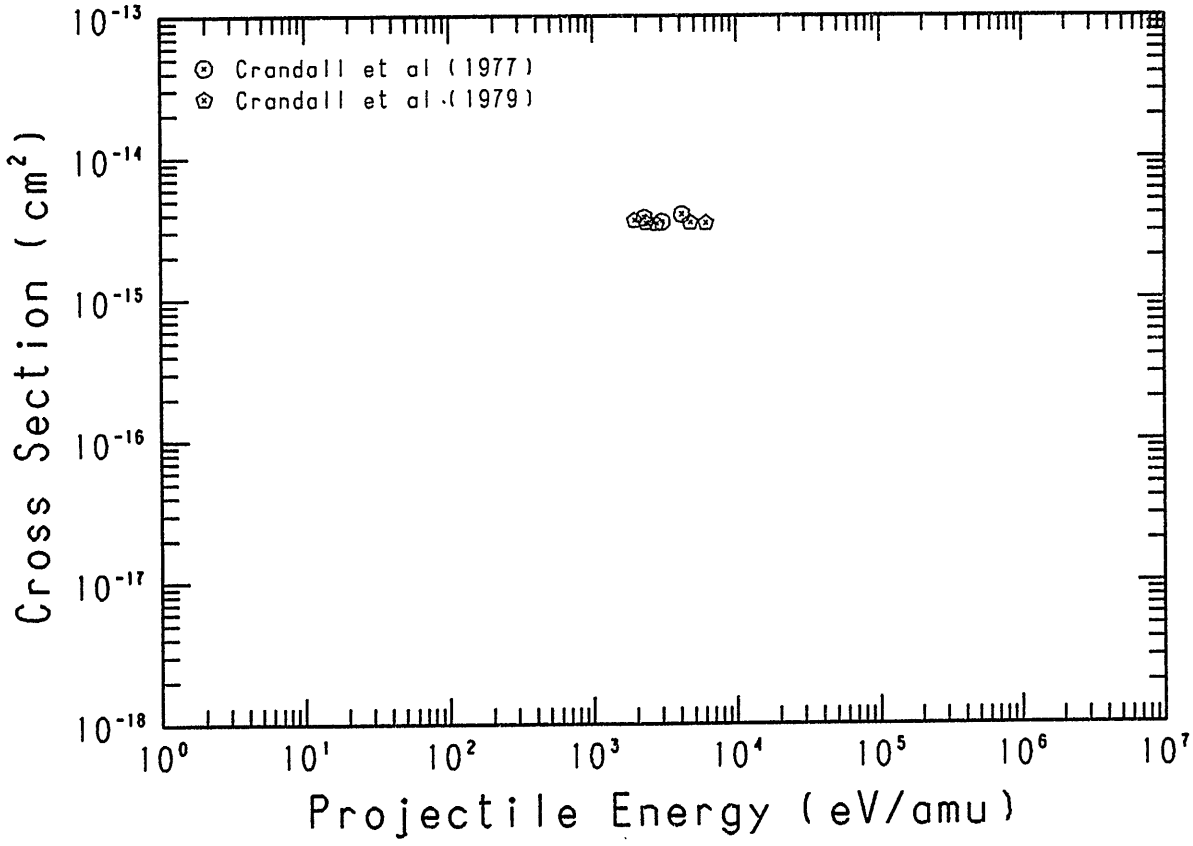


Fig. 33 $F^+ + H_2 \rightarrow F$

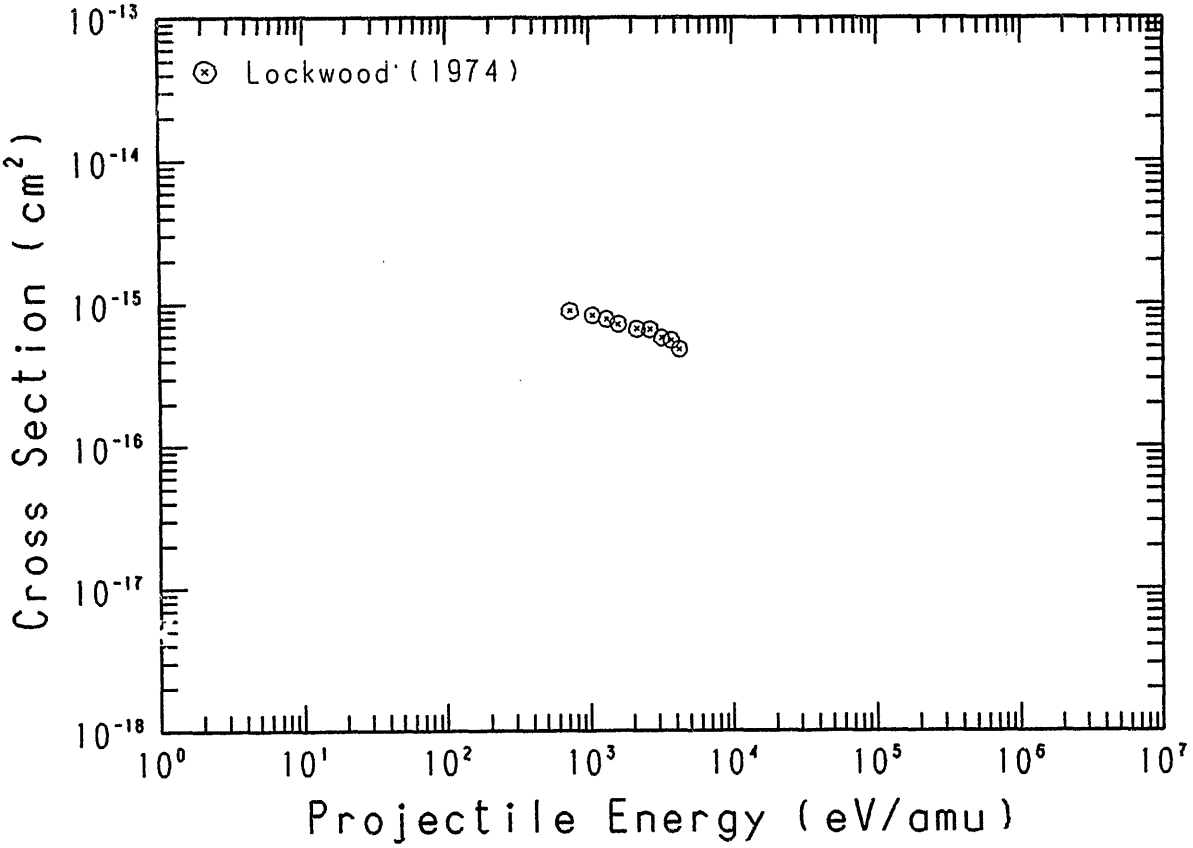


Fig. 34 $F^{9+} + H_2 \rightarrow F^{8+*}$

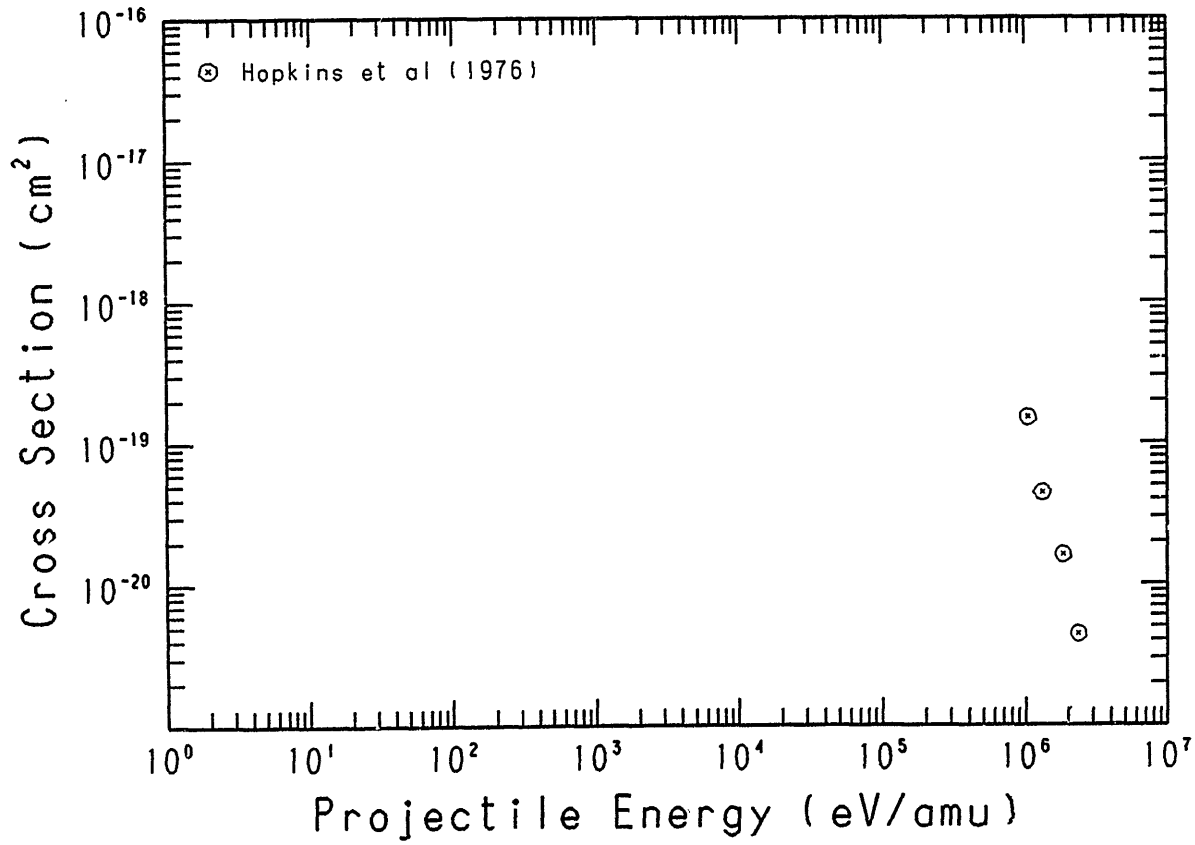


Fig. 35 $Ne^{+} + H_2 \rightarrow Ne$

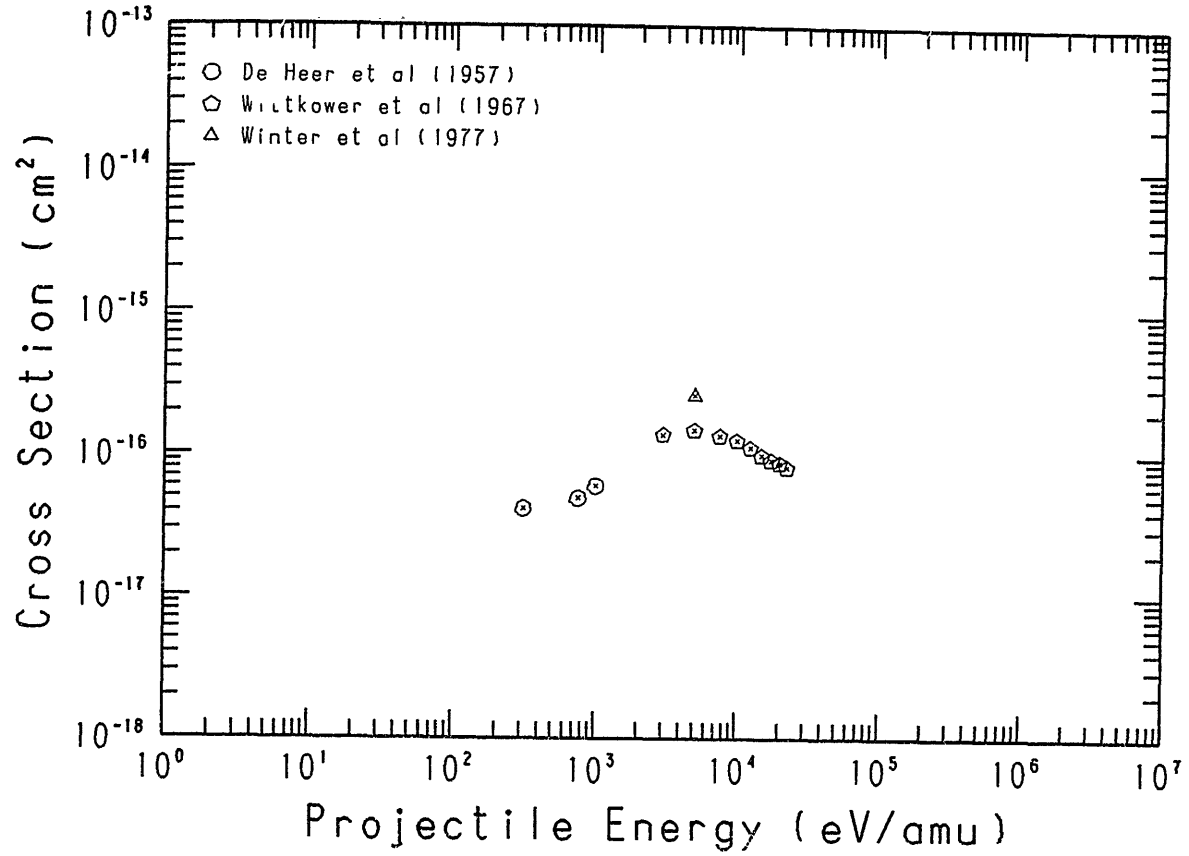


Fig. 36 $Ne^{2+} + H_2 \rightarrow Ne^{+}$

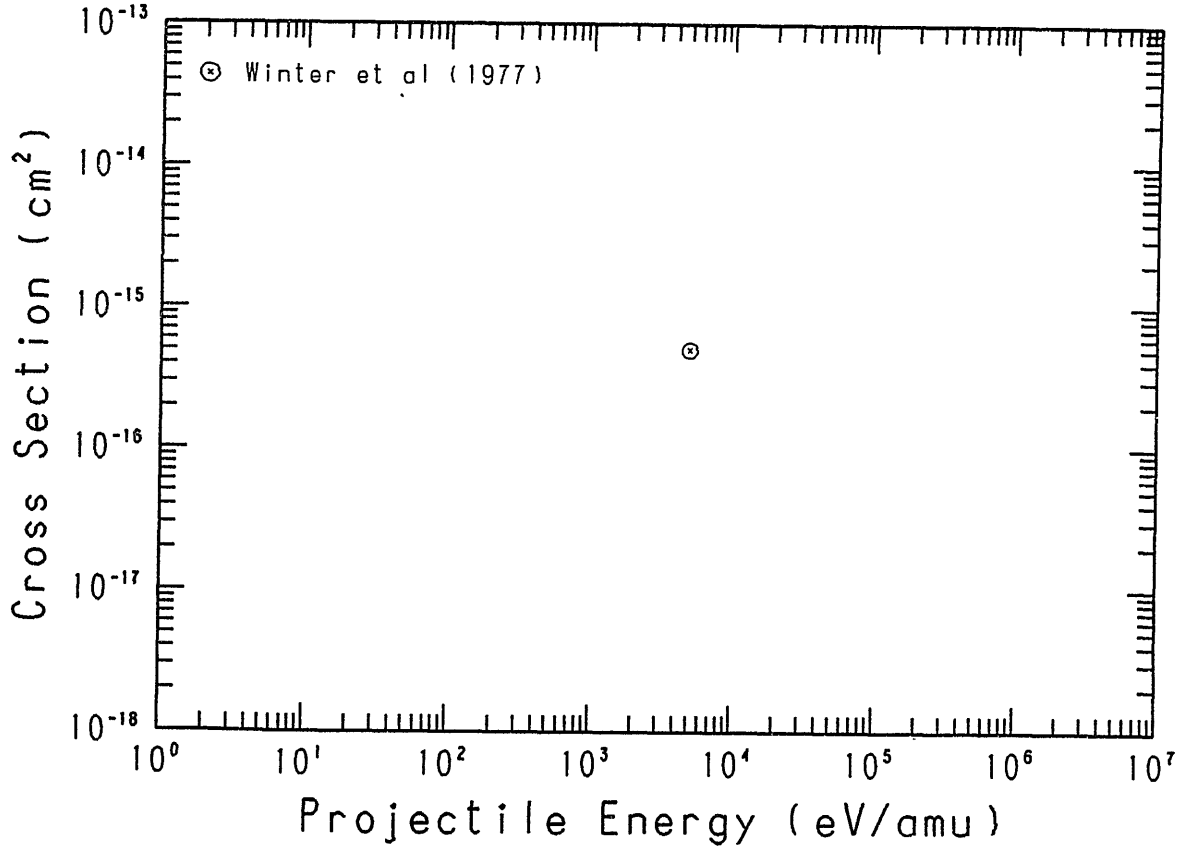


Fig. 37 $Ne^{3+} + H_2 \rightarrow Ne^{2+}$

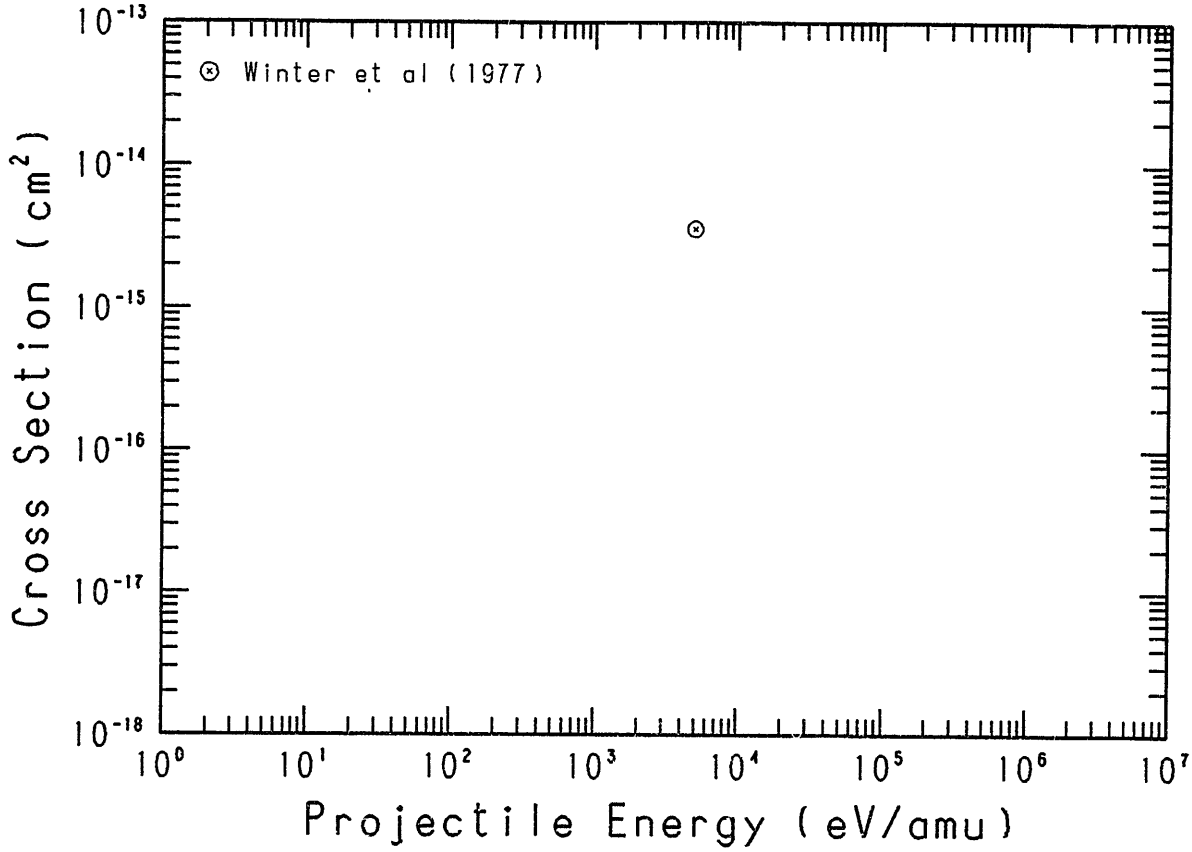


Fig. 38 $Mg^{2+} + H_2 \rightarrow Mg^{+}$

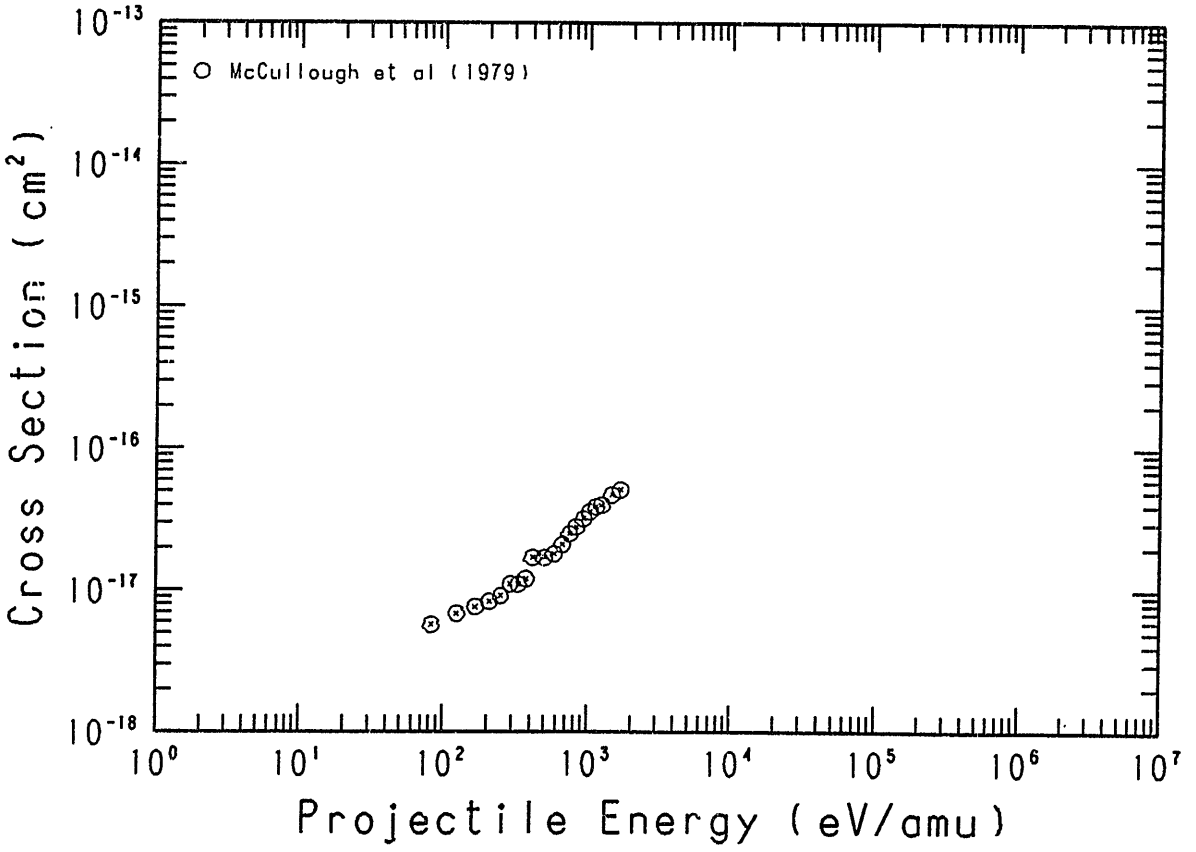


Fig. 39 $Si^{2+} + H_2 \rightarrow Si^{1+}$

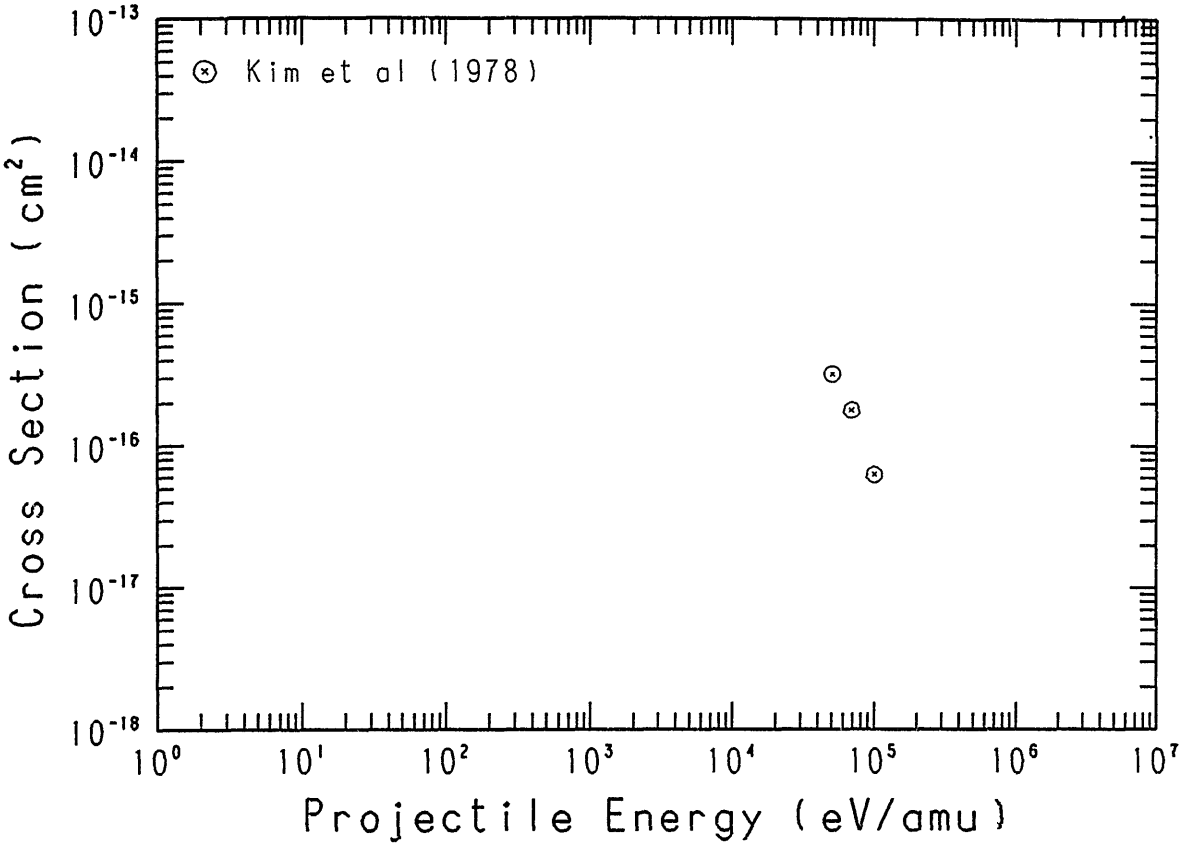


Fig. 40 $Si^{3+} + H_2 \rightarrow Si^{2+}$

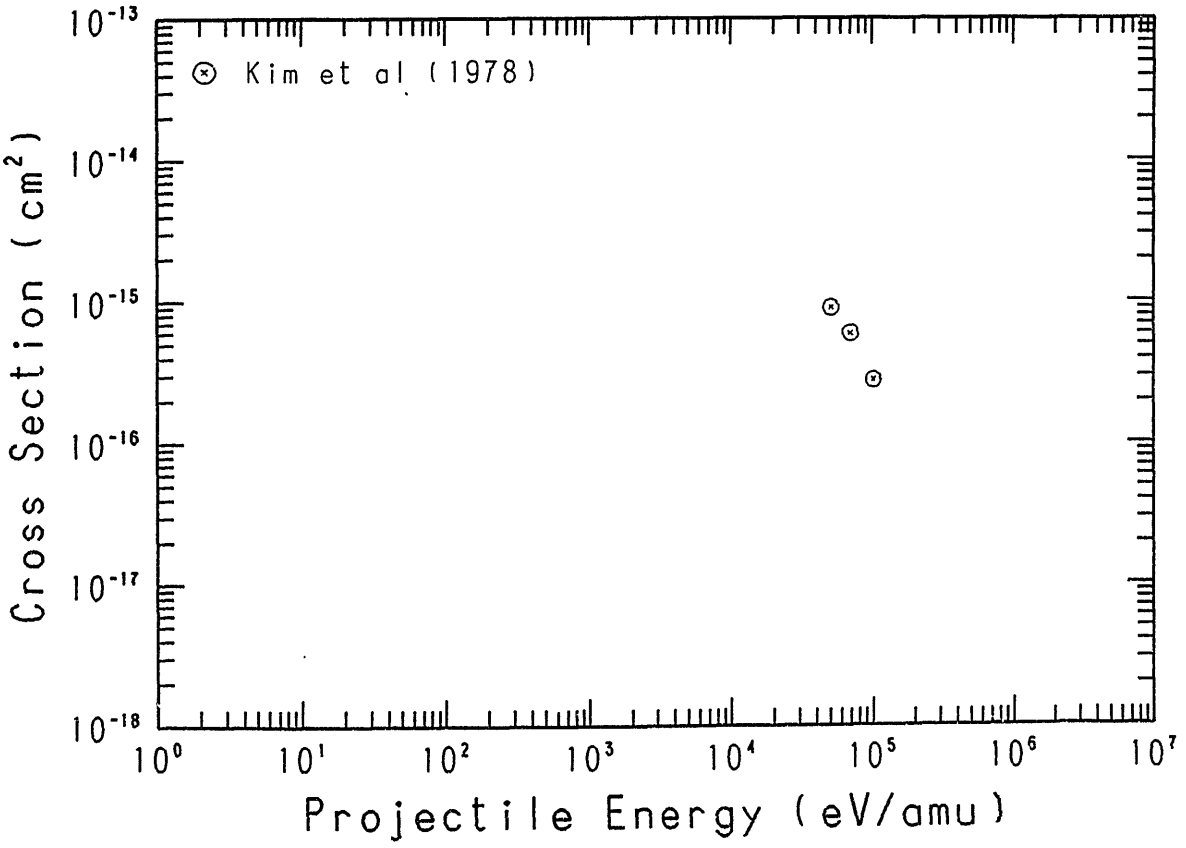


Fig. 41 $Si^{4+} + H_2 \rightarrow Si^{3+}$

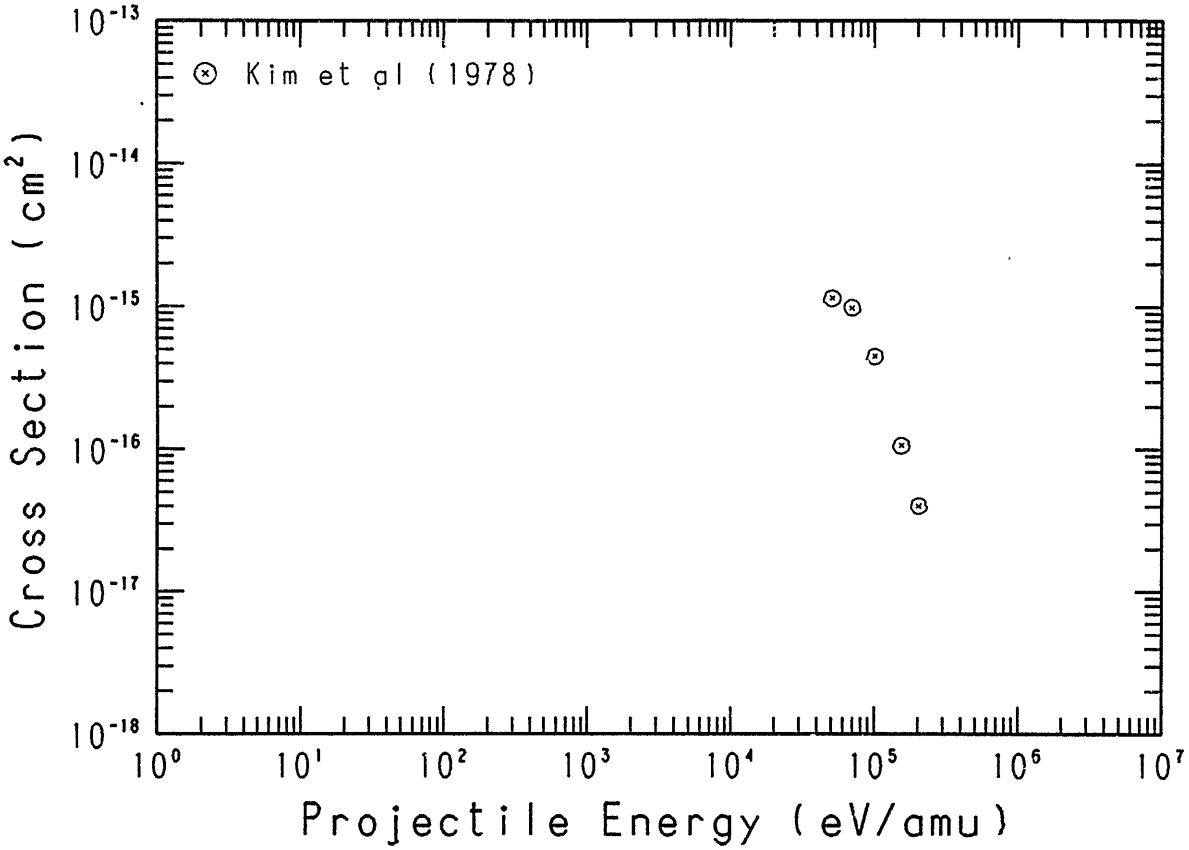


Fig. 42 $Si^{5+} + H_2 \rightarrow Si^{4+}$

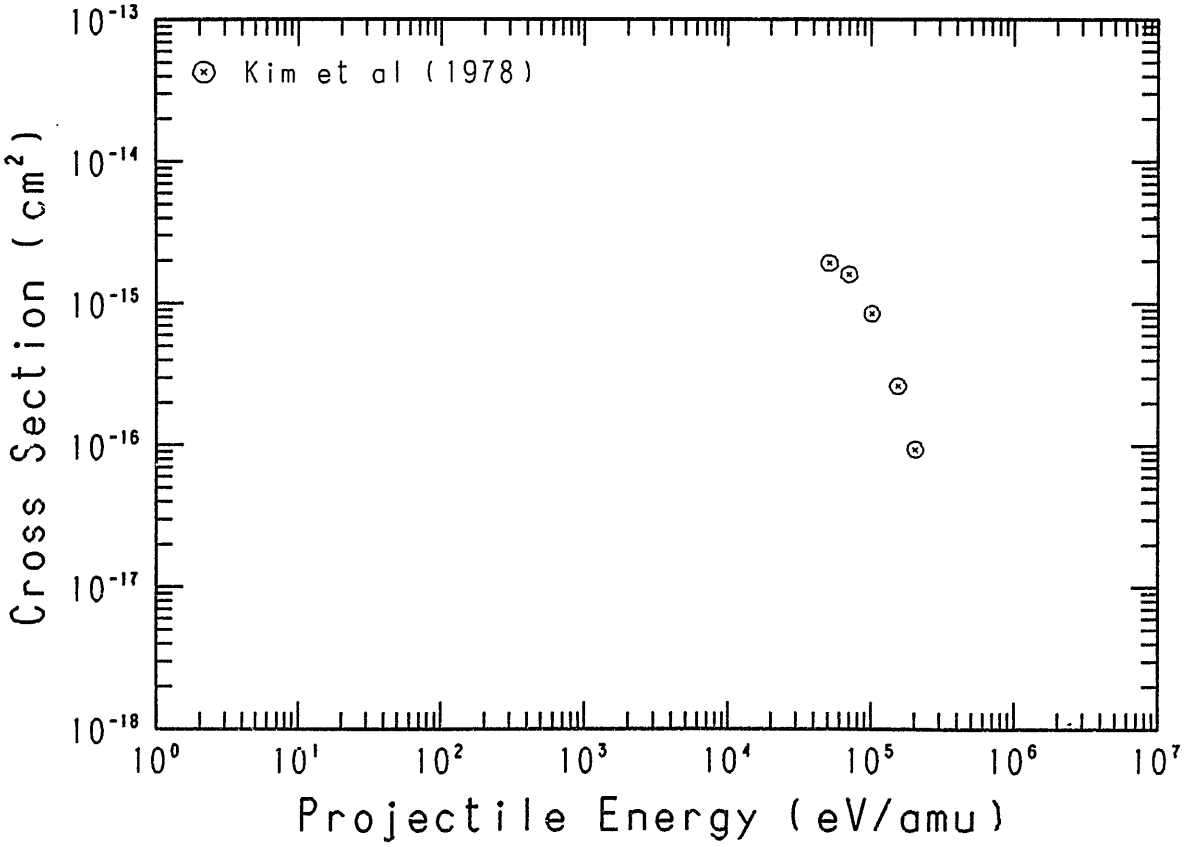


Fig. 43 $Si^{6+} + H_2 \rightarrow Si^{5+}$

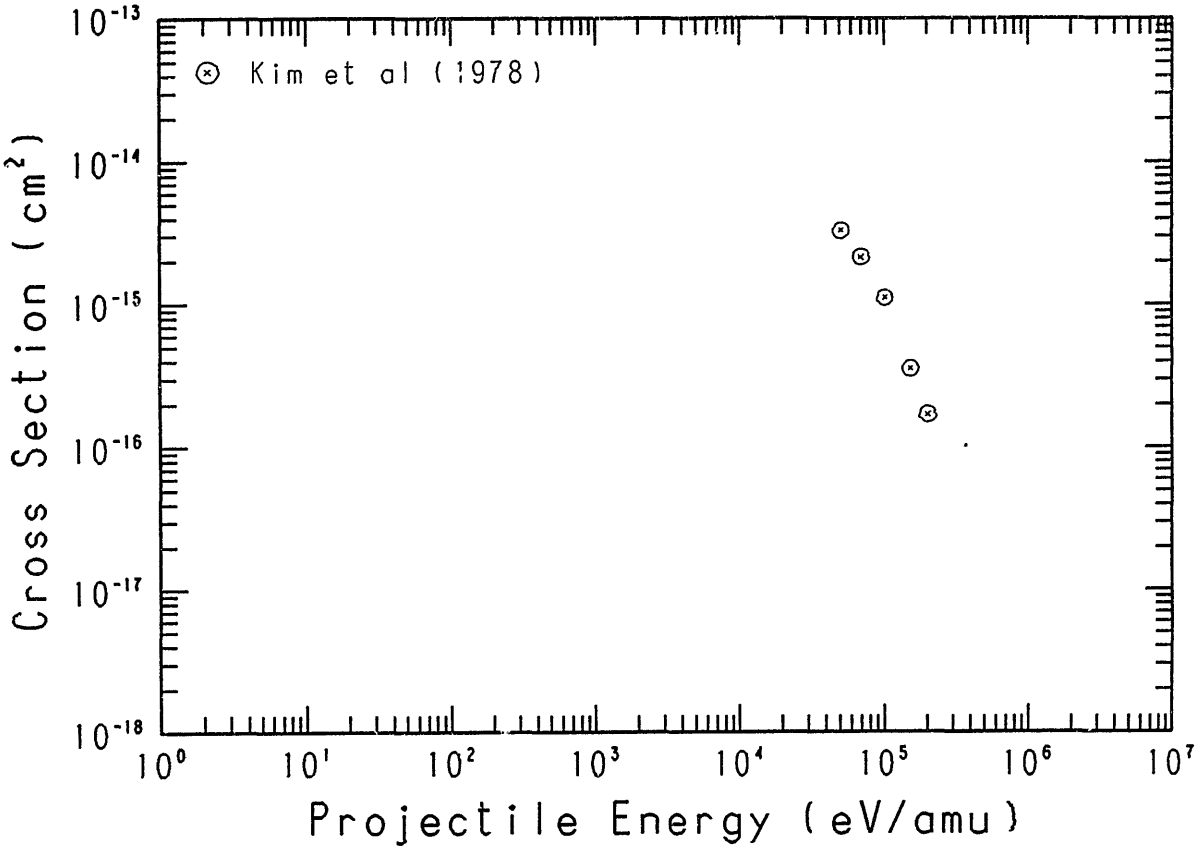
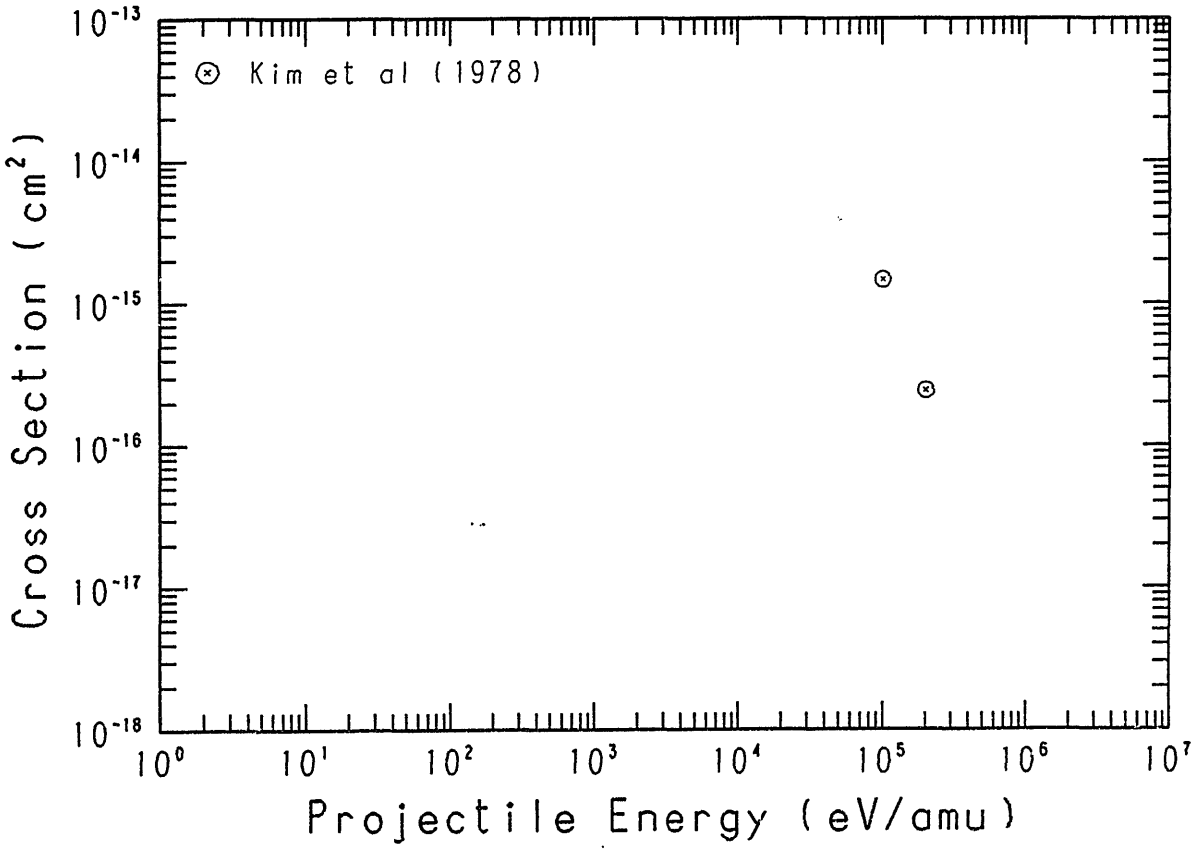


Fig. 44 $Si^{7+} + H_2 \rightarrow Si^{6+}$



Graph No. 19

Fig. 45 $Si^{8+} + H_2 \rightarrow Si^{7+}$

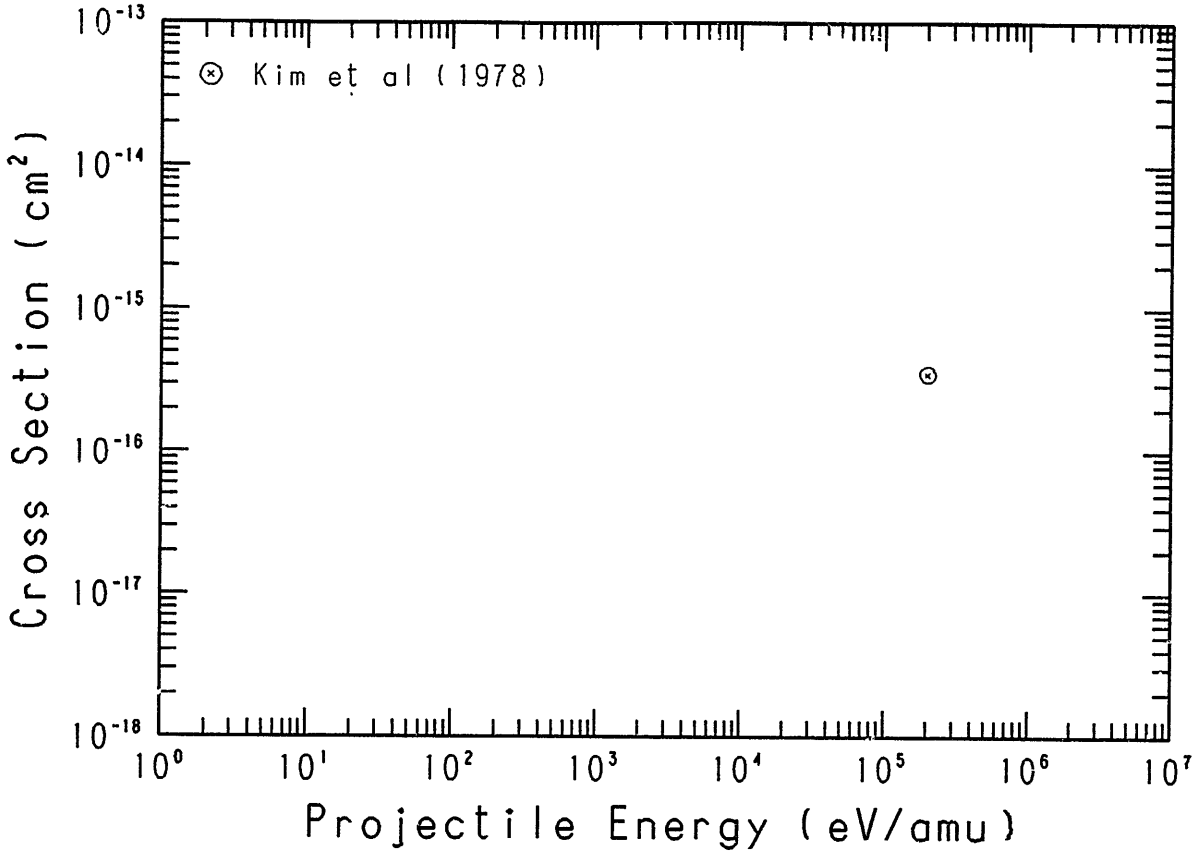


Fig. 46 $Si^{9+} + H_2 \rightarrow Si^{8+}$

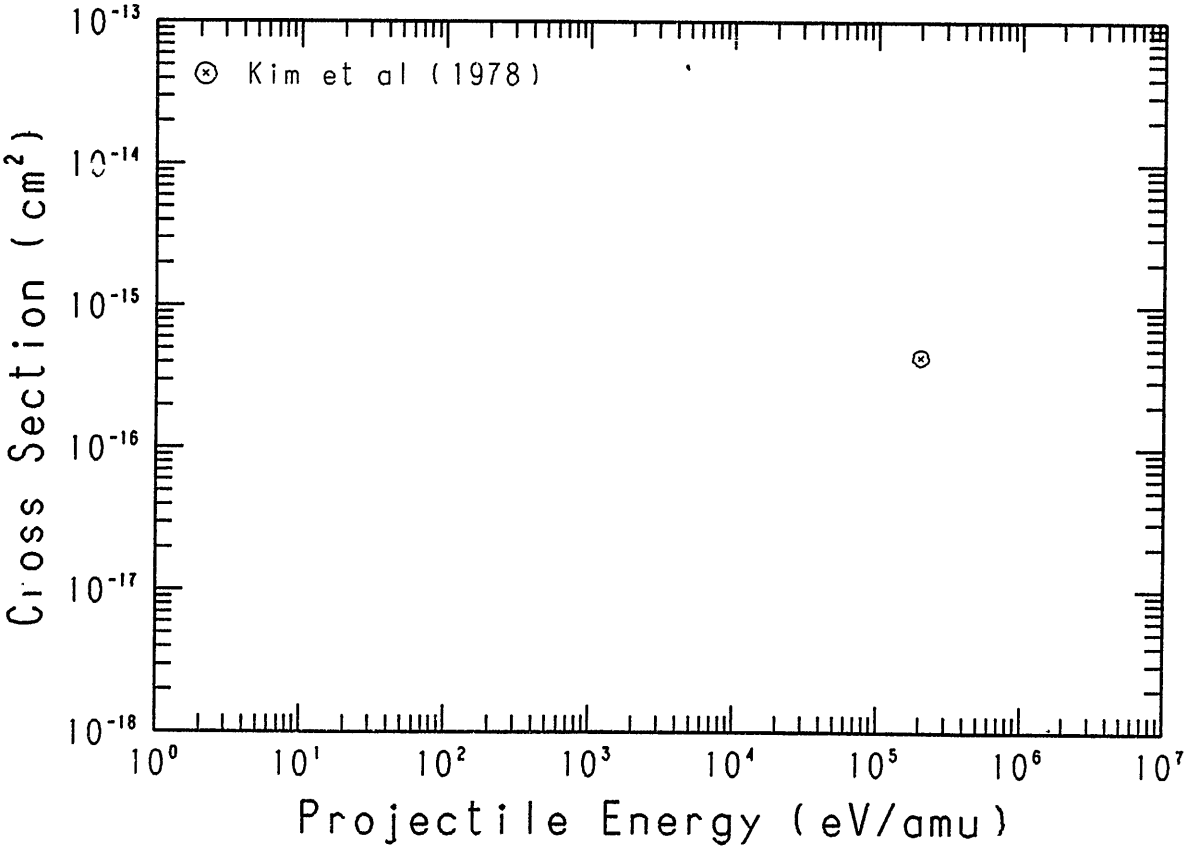


Fig. 47 $Si^{11+} + H_2 \rightarrow Si^{10+}$

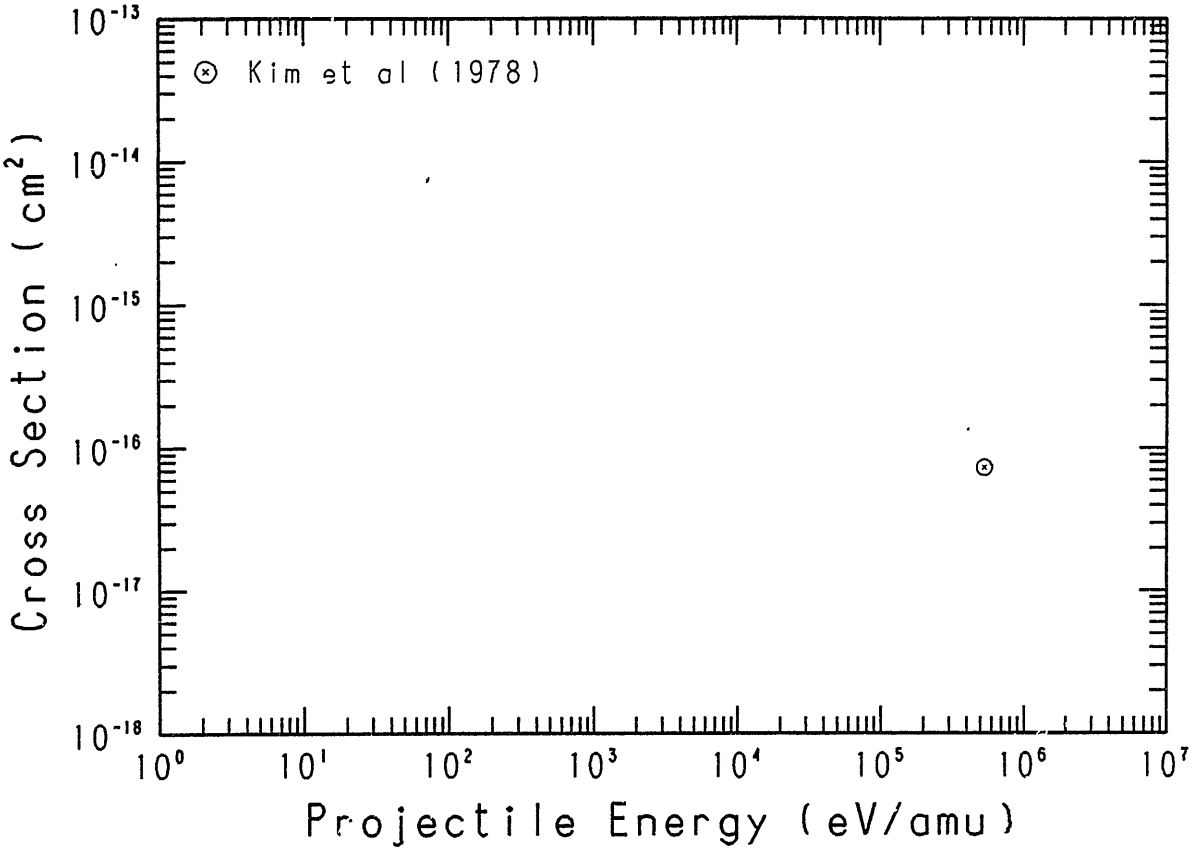


Fig. 48 $Cl^{3+} + H_2 \rightarrow Cl^{2+}$

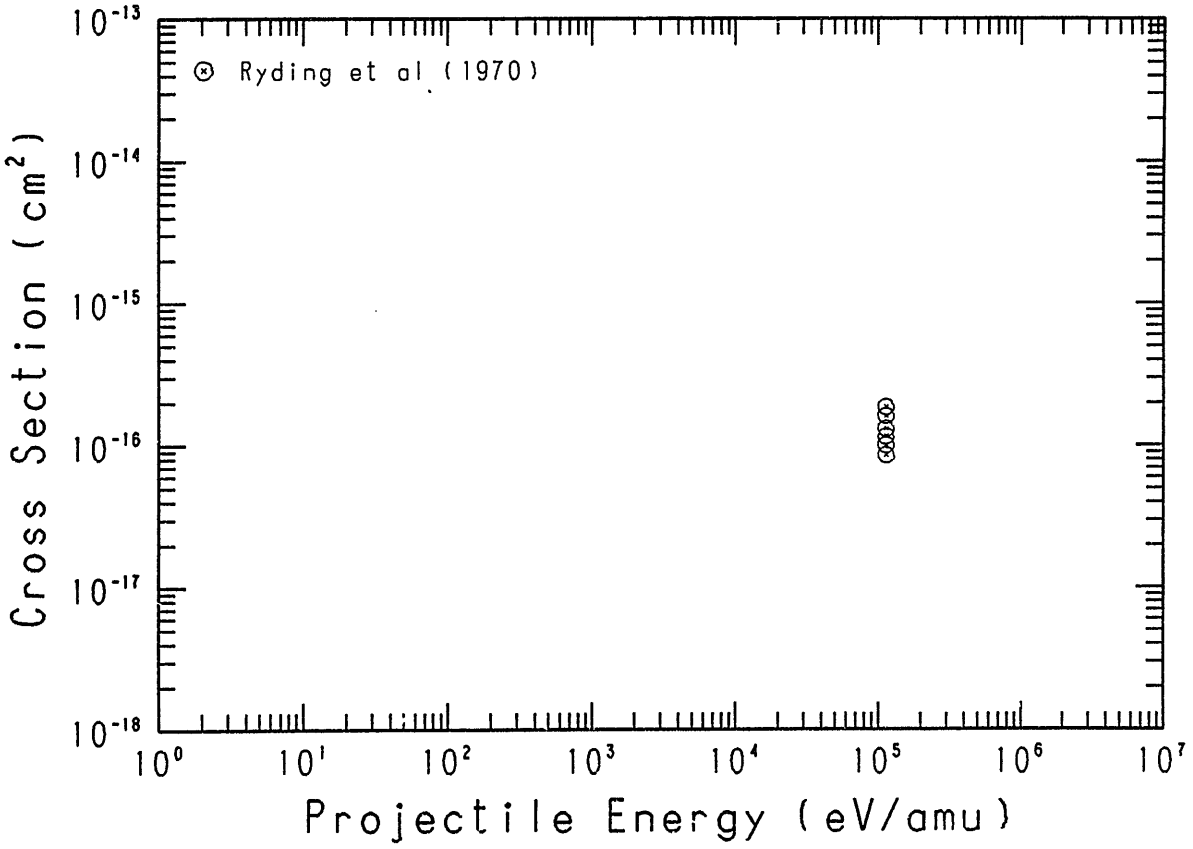


Fig. 49 $Cl^{4+} + H_2 \rightarrow Cl^{3+}$

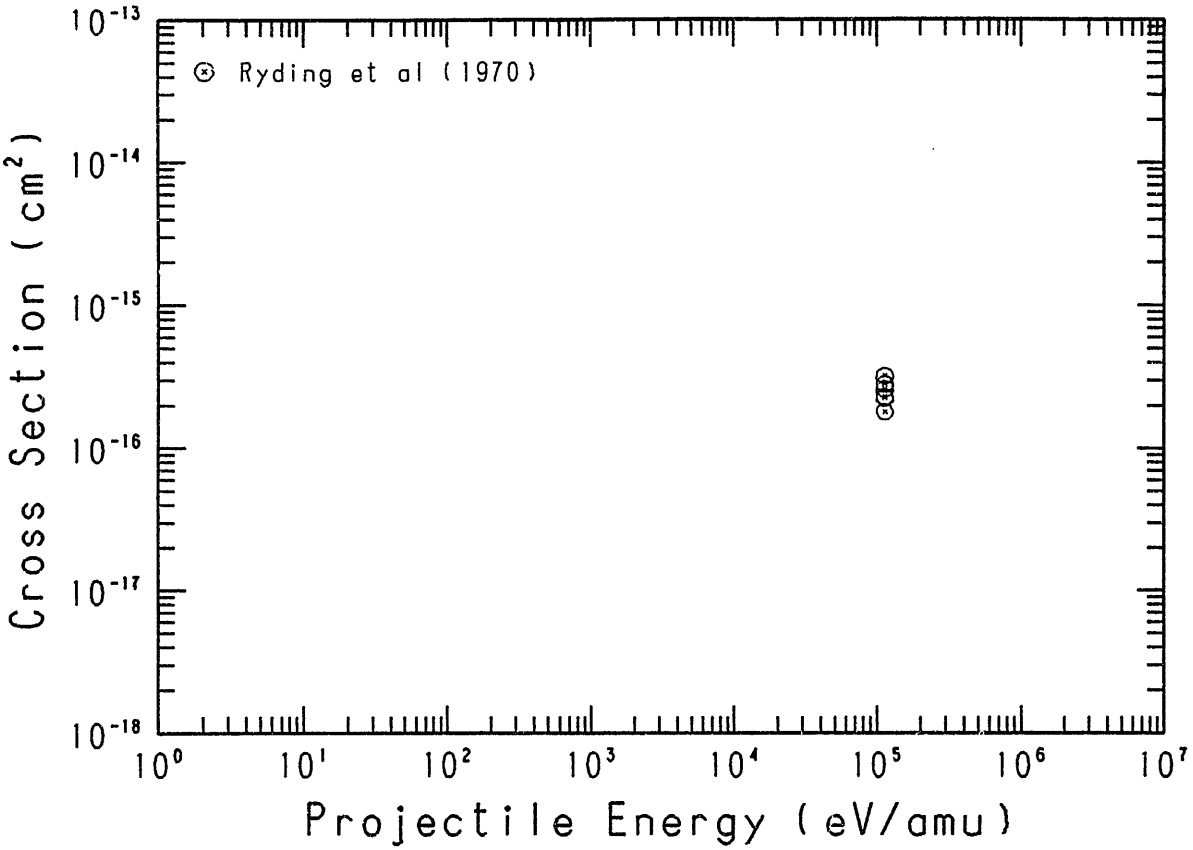
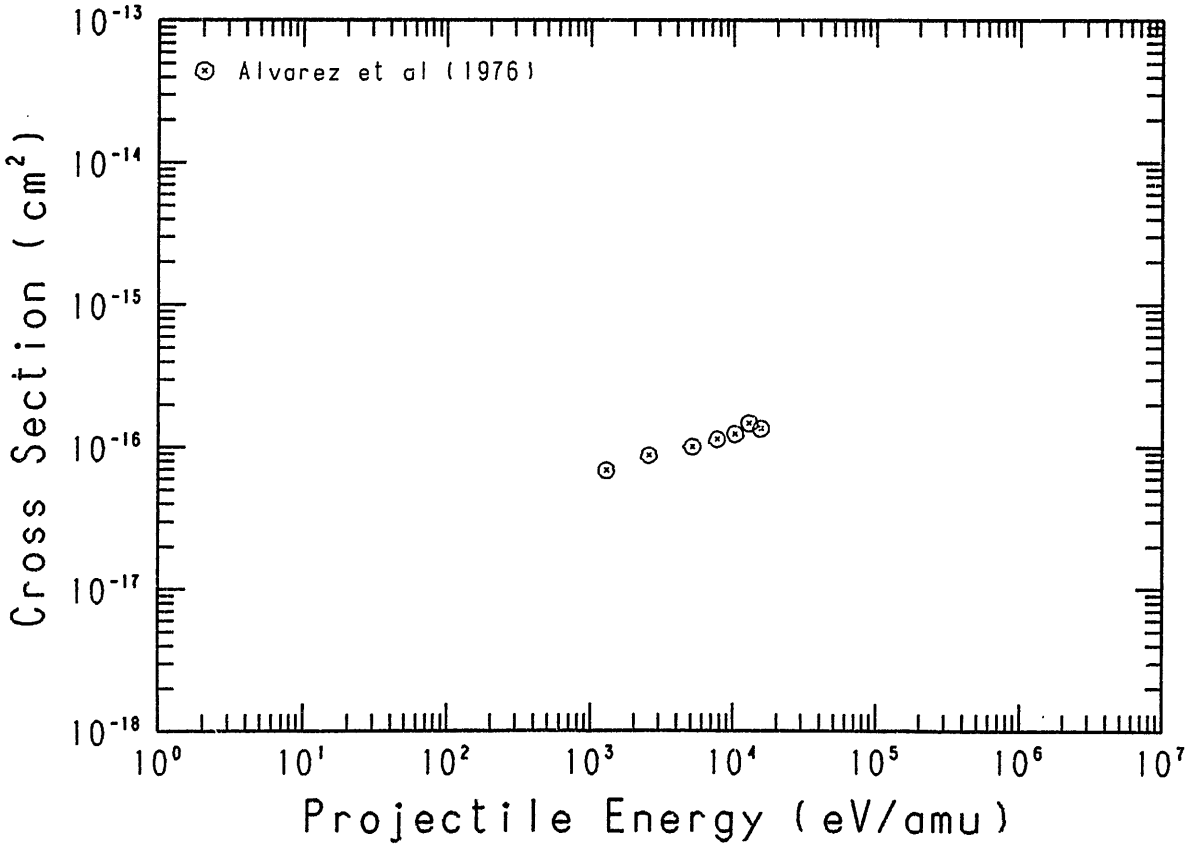


Fig. 50 $K^+ + H_2 \rightarrow K$



Graph No. 8

Fig. 51 $Ar^{+} + H_2 \rightarrow Ar$

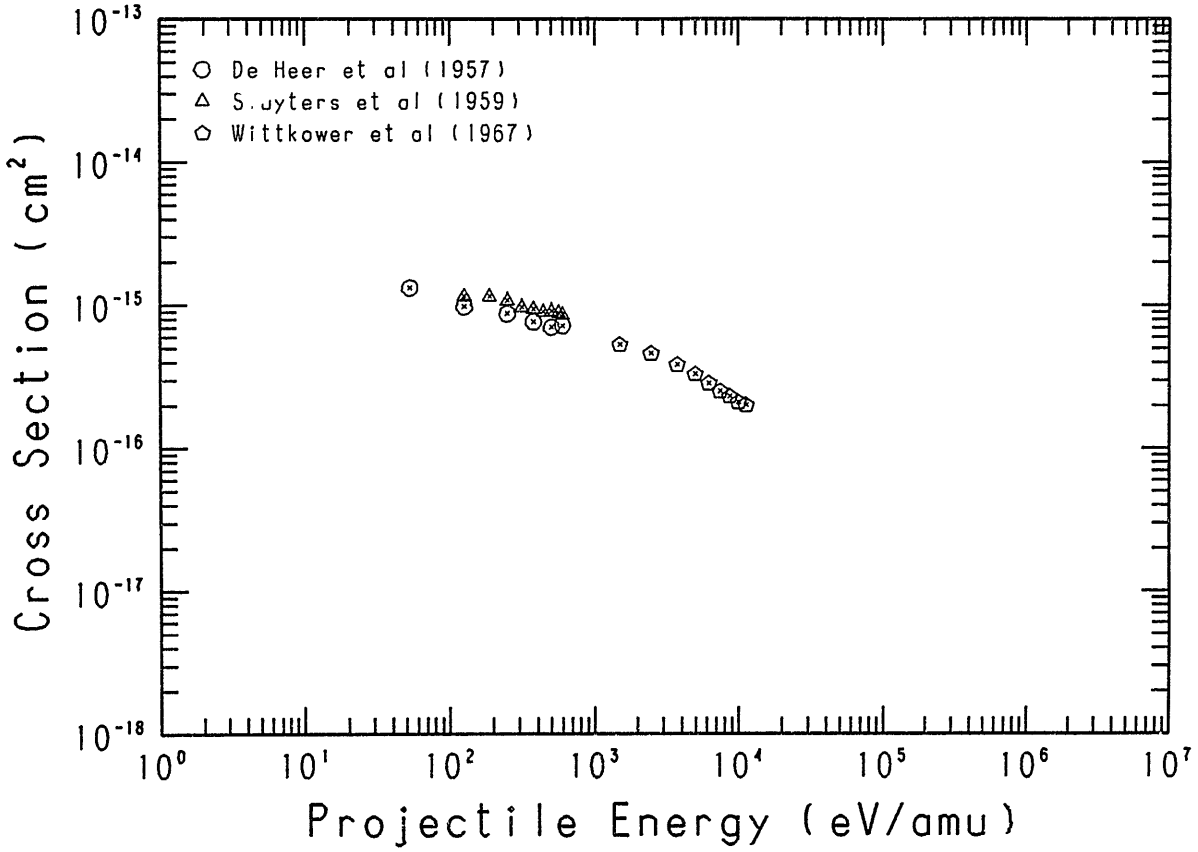


Fig. 52 $Ar^{2+} + H_2 \rightarrow Ar^{+}$

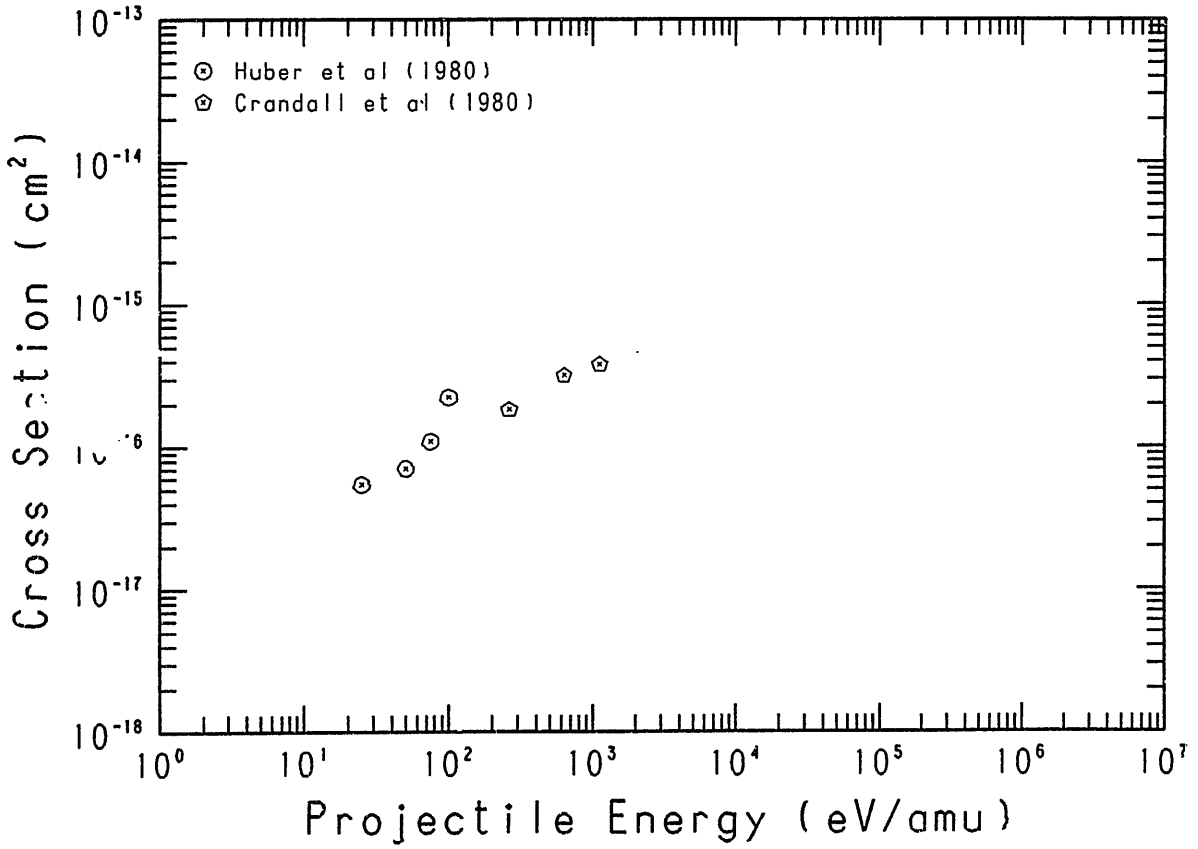


Fig. 53 $Ar^{3+} + H_2 \rightarrow Ar^{+}$

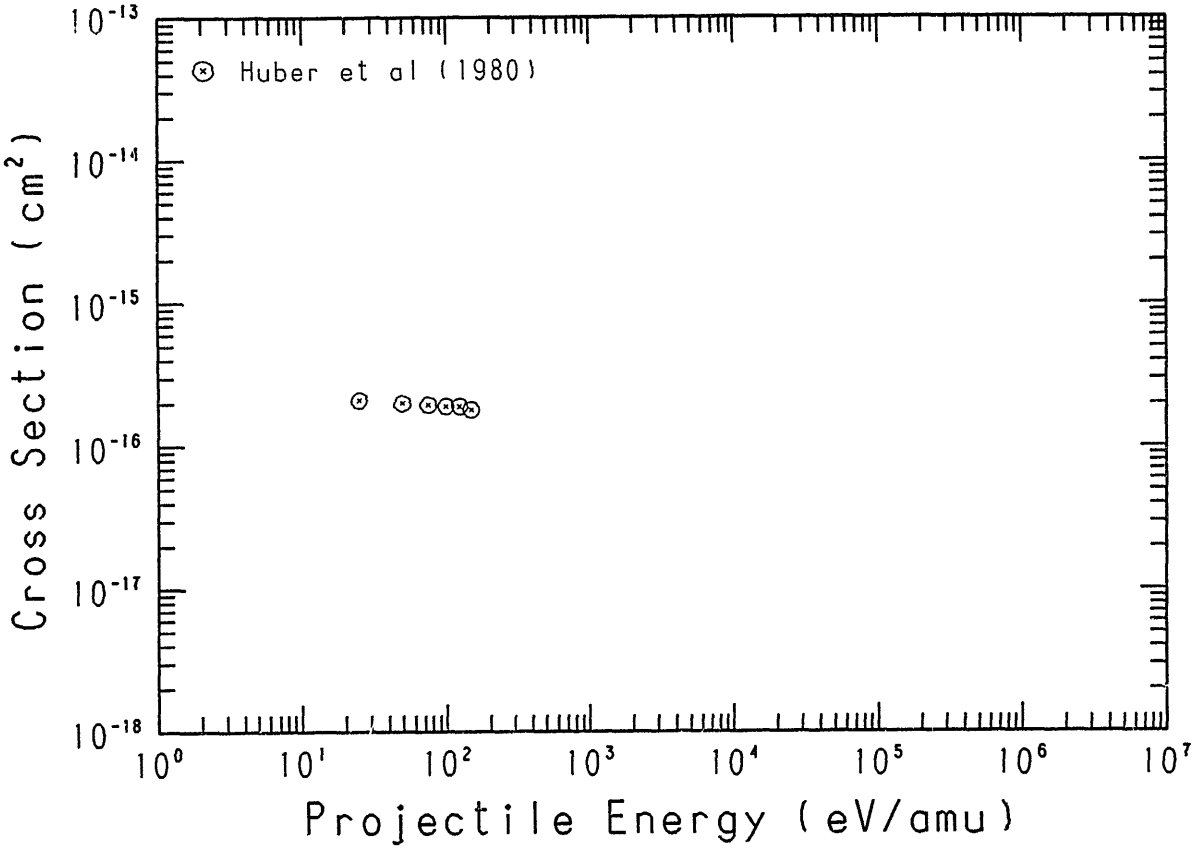


Fig. 54 $Ar^{3+} + H_2 \rightarrow Ar^{2+}$

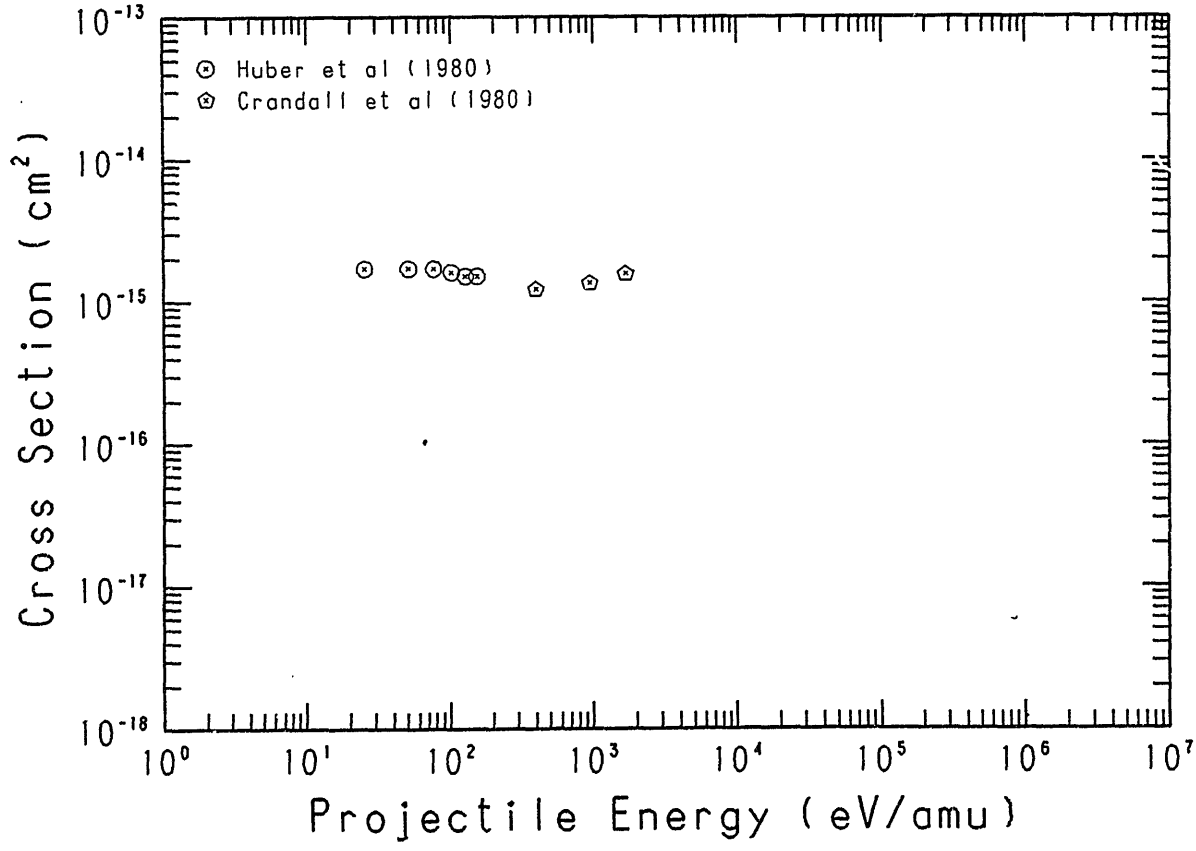


Fig. 55 $Ar^{4+} + H_2 \rightarrow Ar^{2+}$

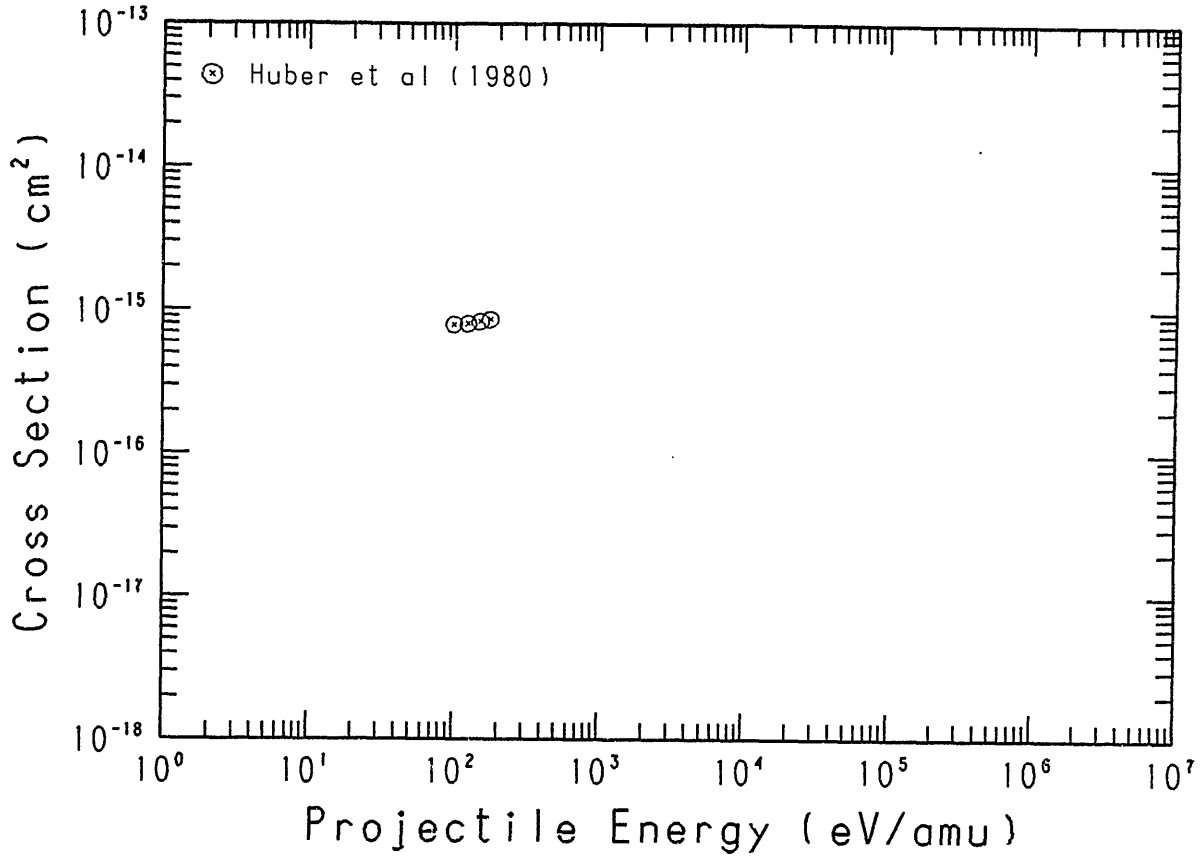


Fig. 56 $Ar^{4+} + H_2 \rightarrow Ar^{3+}$

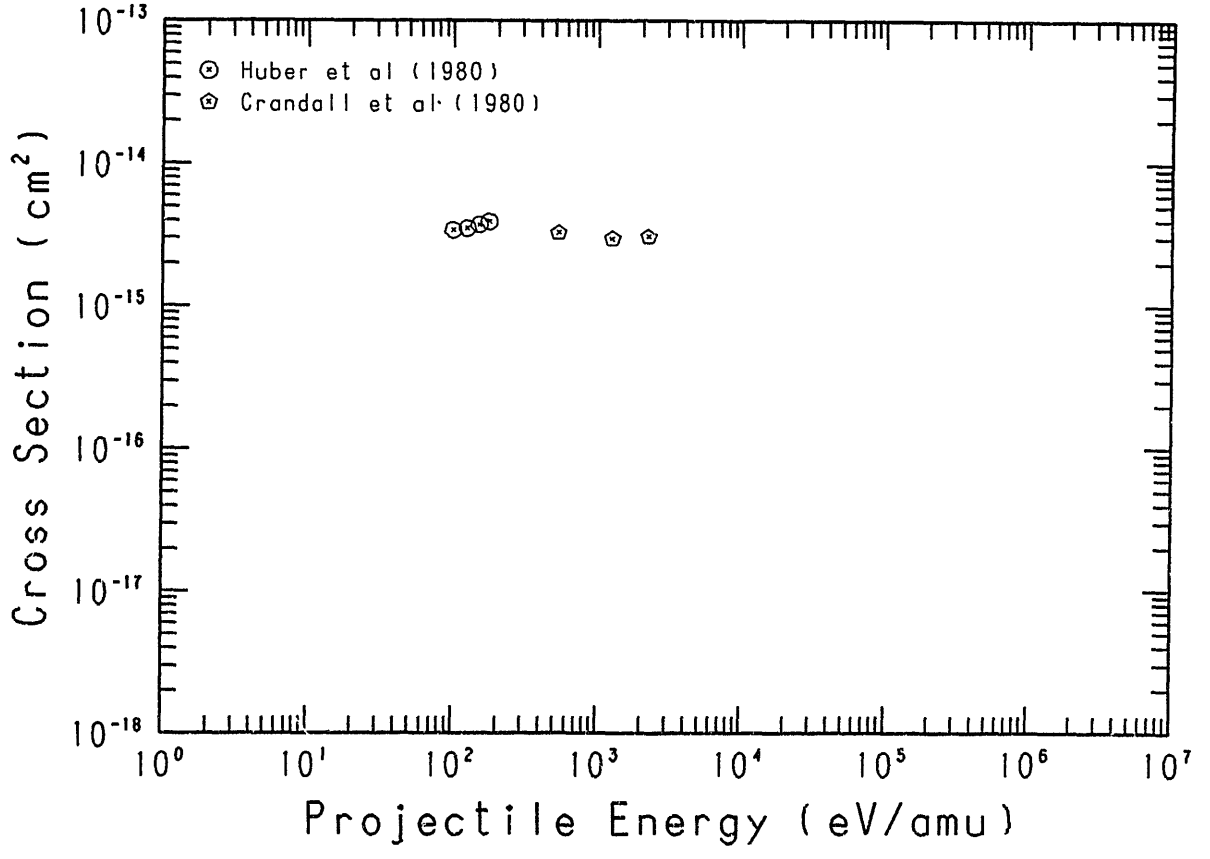


Fig. 57 $Ar^{5+} + H_2 \rightarrow Ar^{4+}$

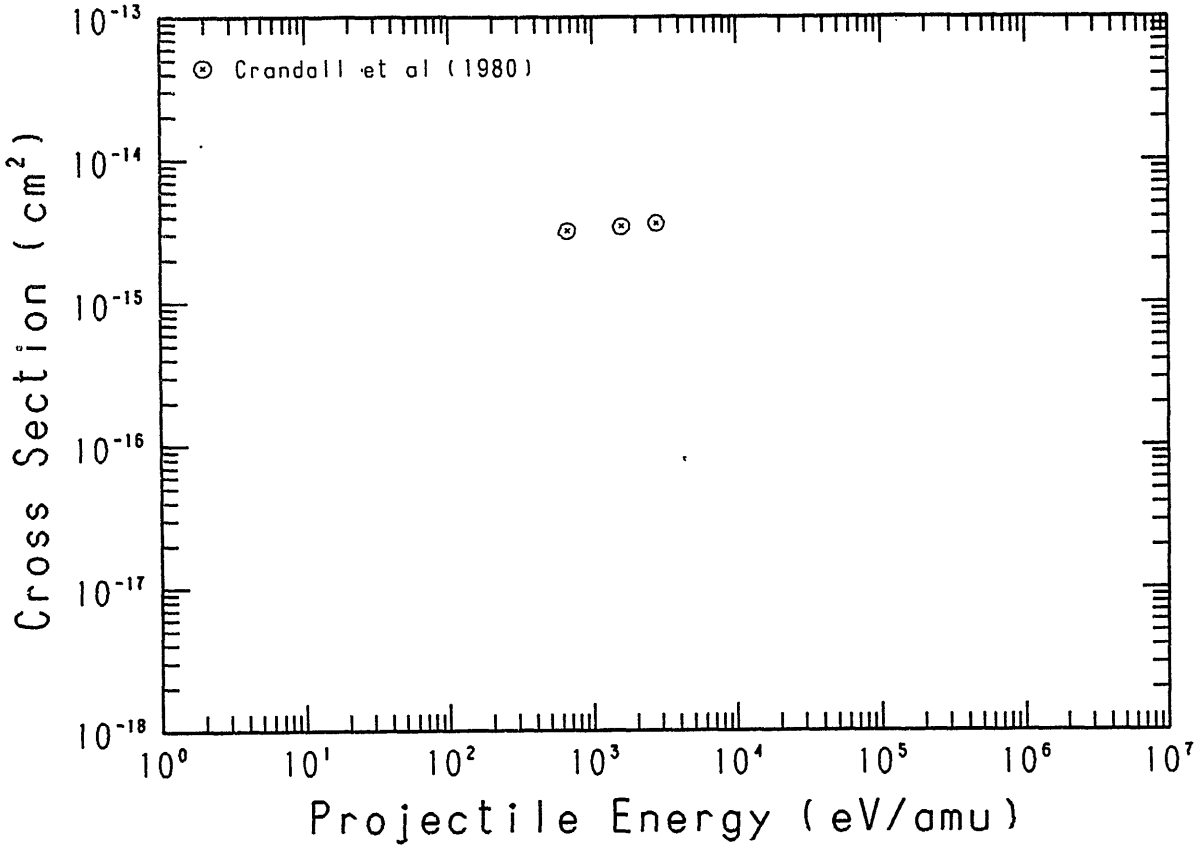


Fig. 58 $Ar^{6+} + H_2 \rightarrow Ar^{5+}$

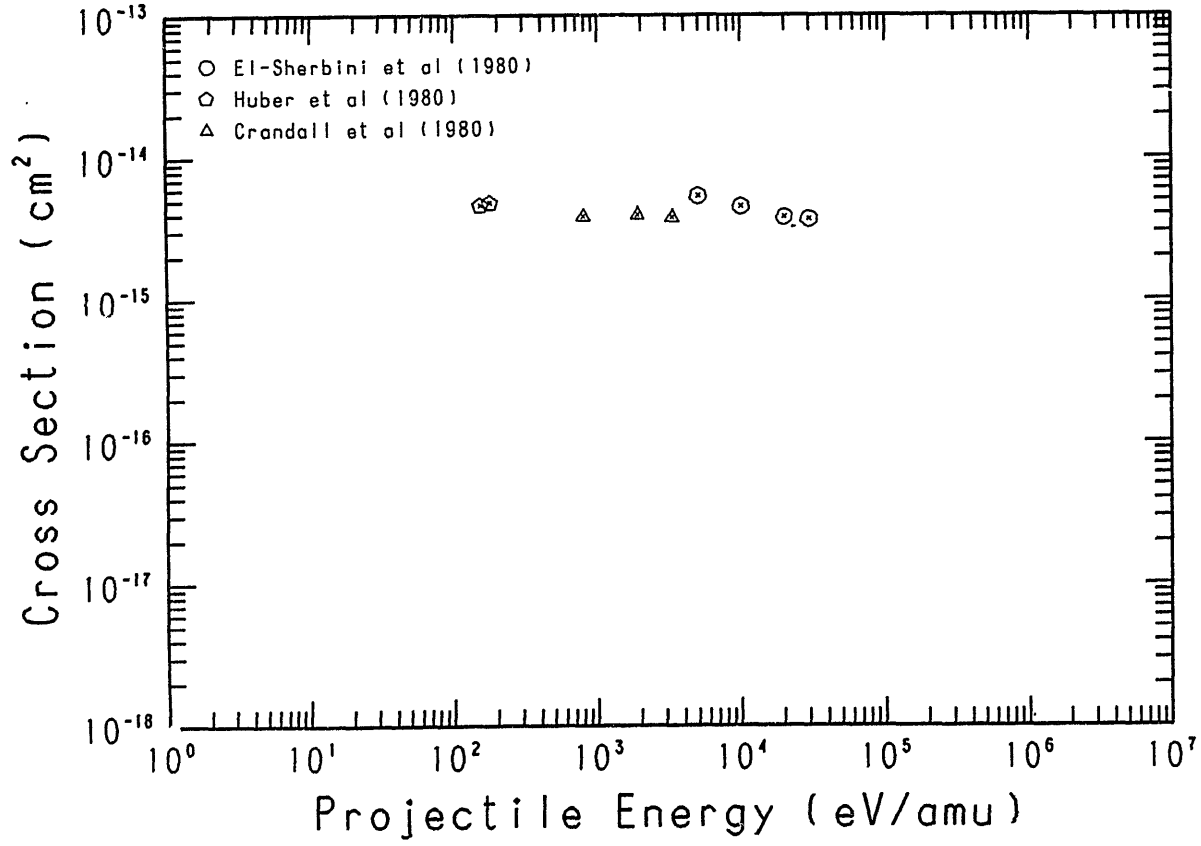


Fig. 59 $Ar^{7+} + H_2 \rightarrow Ar^{6+}$

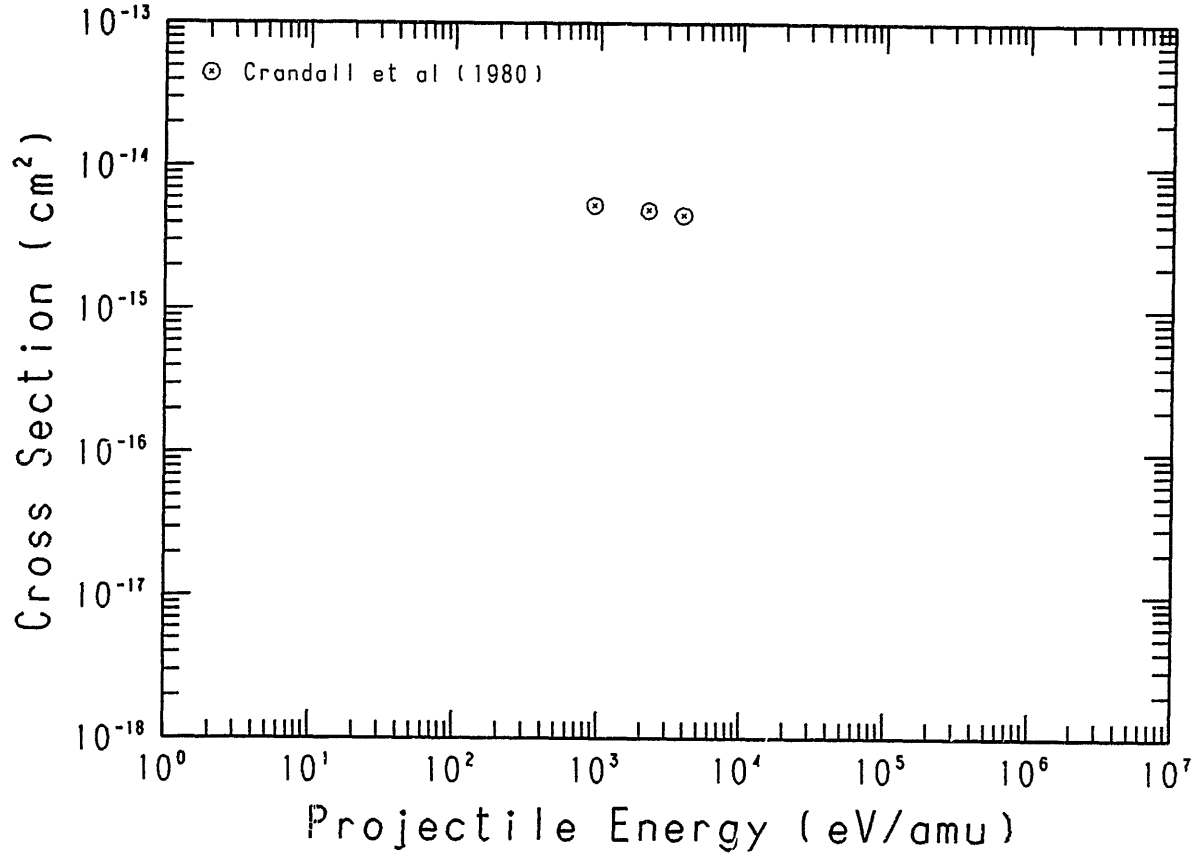


Fig. 60 $Ar^{8+} + H_2 \rightarrow Ar^{7+}$

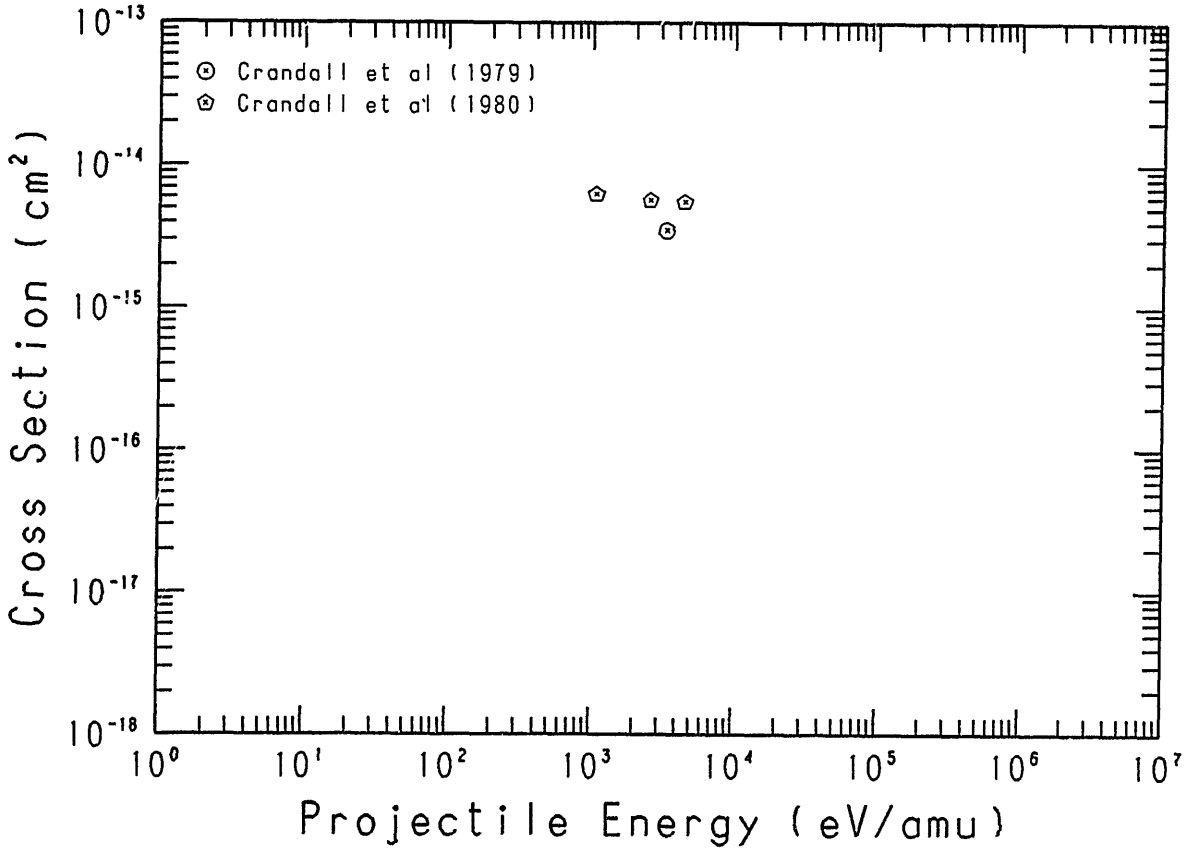


Fig. 61 $Ar^{9+} + H_2 \rightarrow Ar^{8+}$

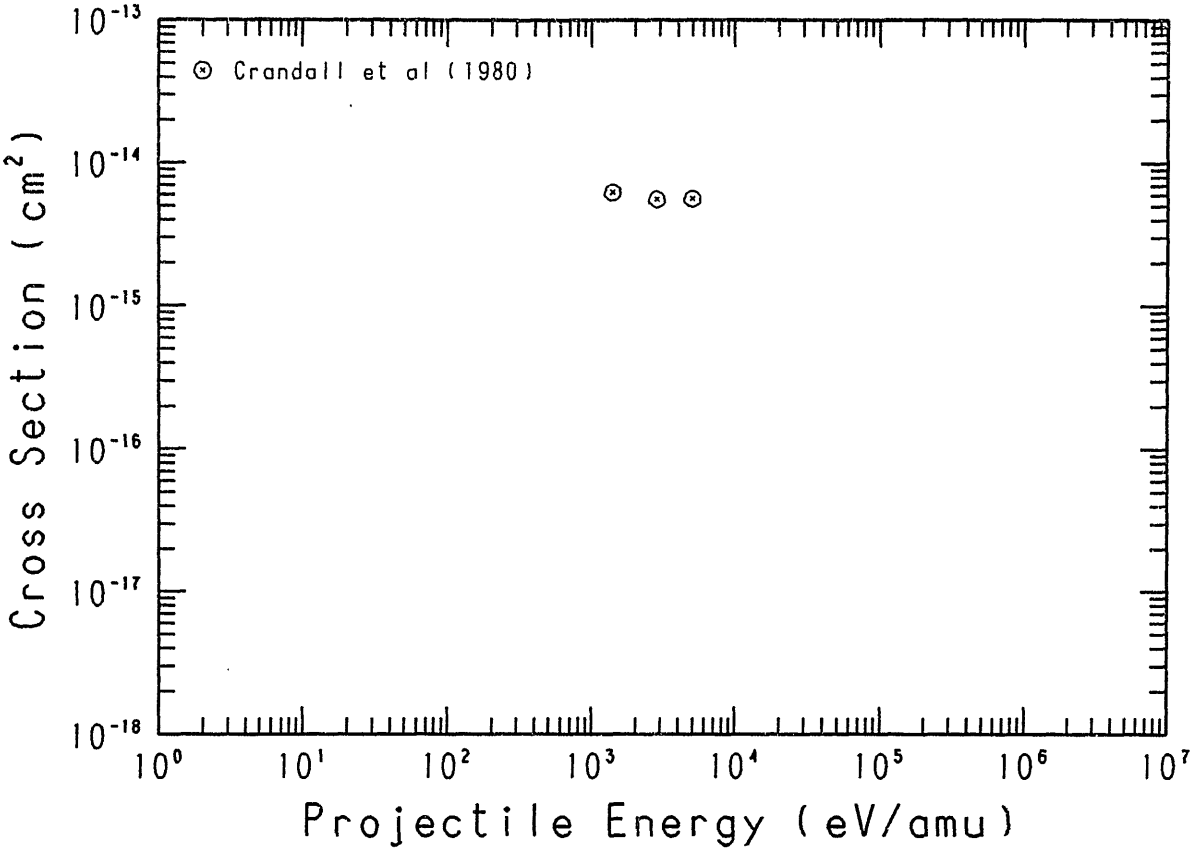


Fig. 62 $Ti^{2+} + H_2 \rightarrow Ti$

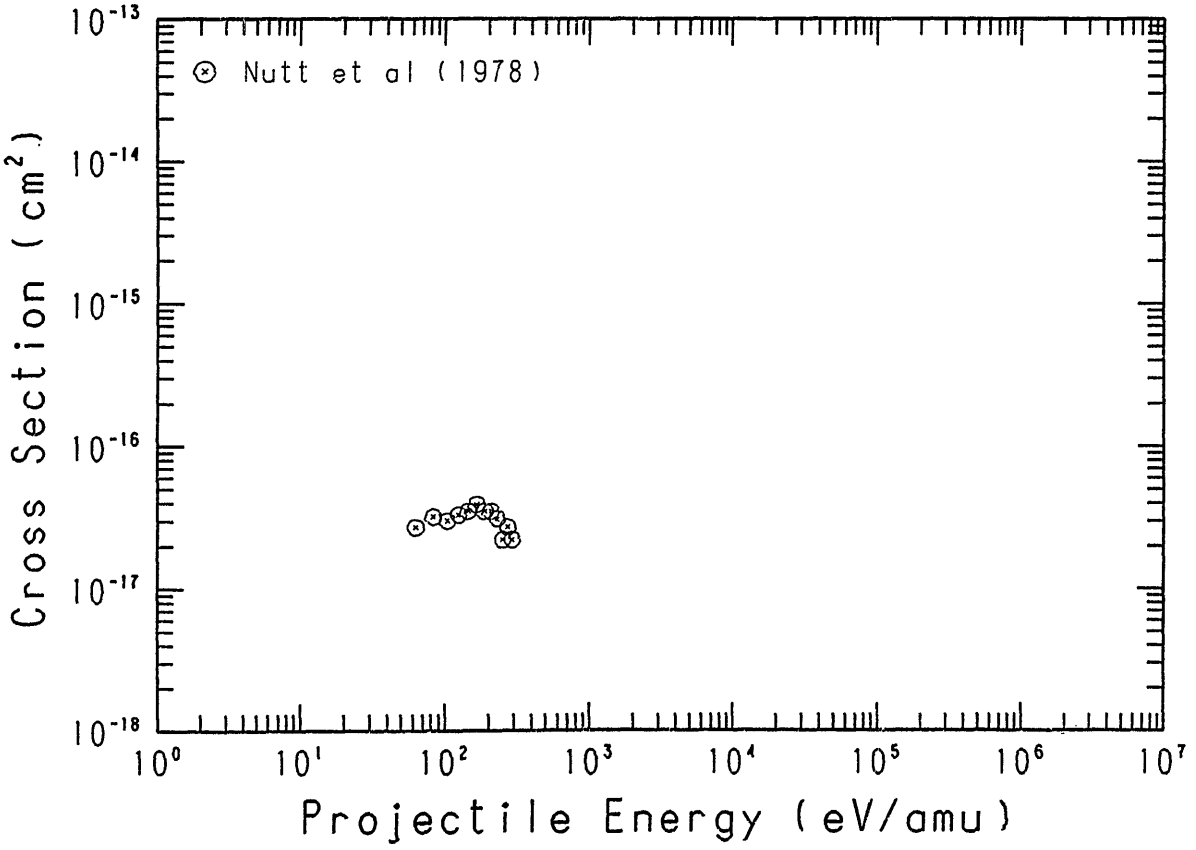


Fig. 63 $Ti^{2+} + H_2 \rightarrow Ti^{+}$

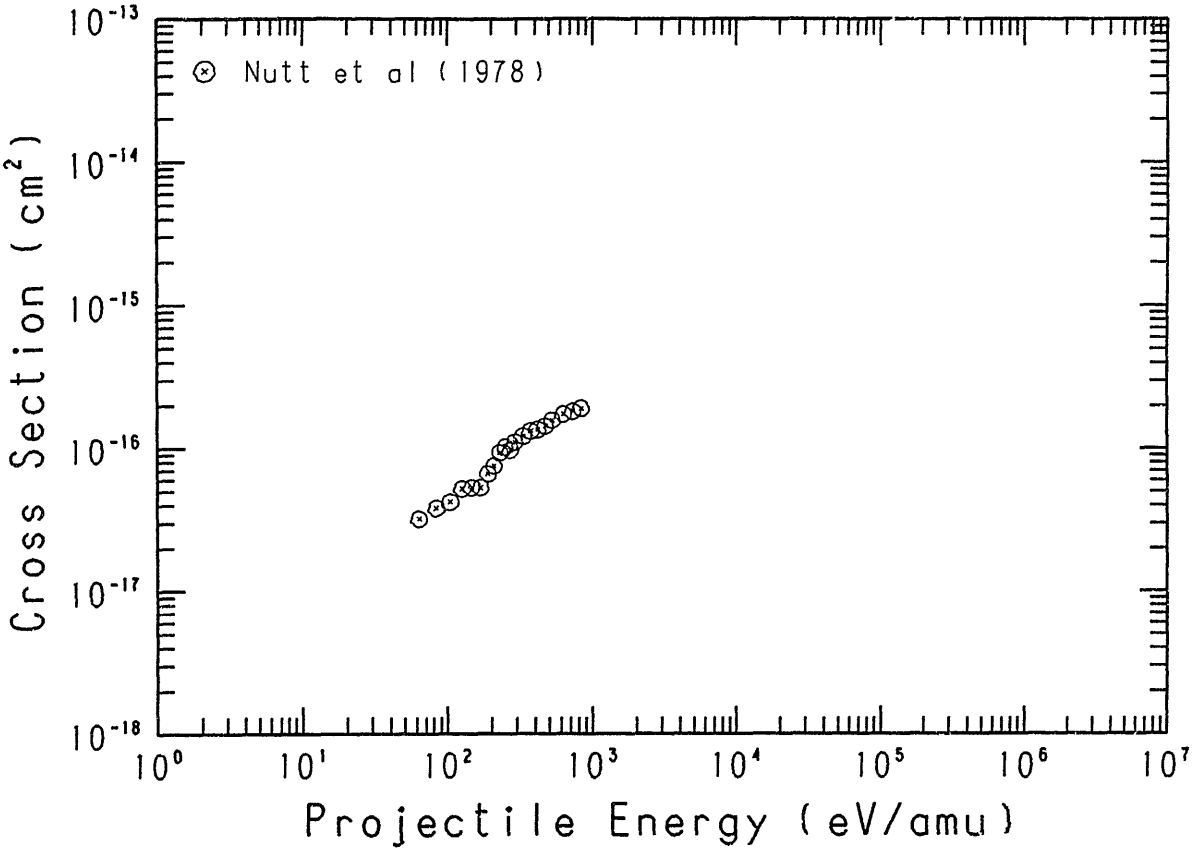


Fig. 64 $Fe^{4+} + H_2 \rightarrow Fe^{3+}$

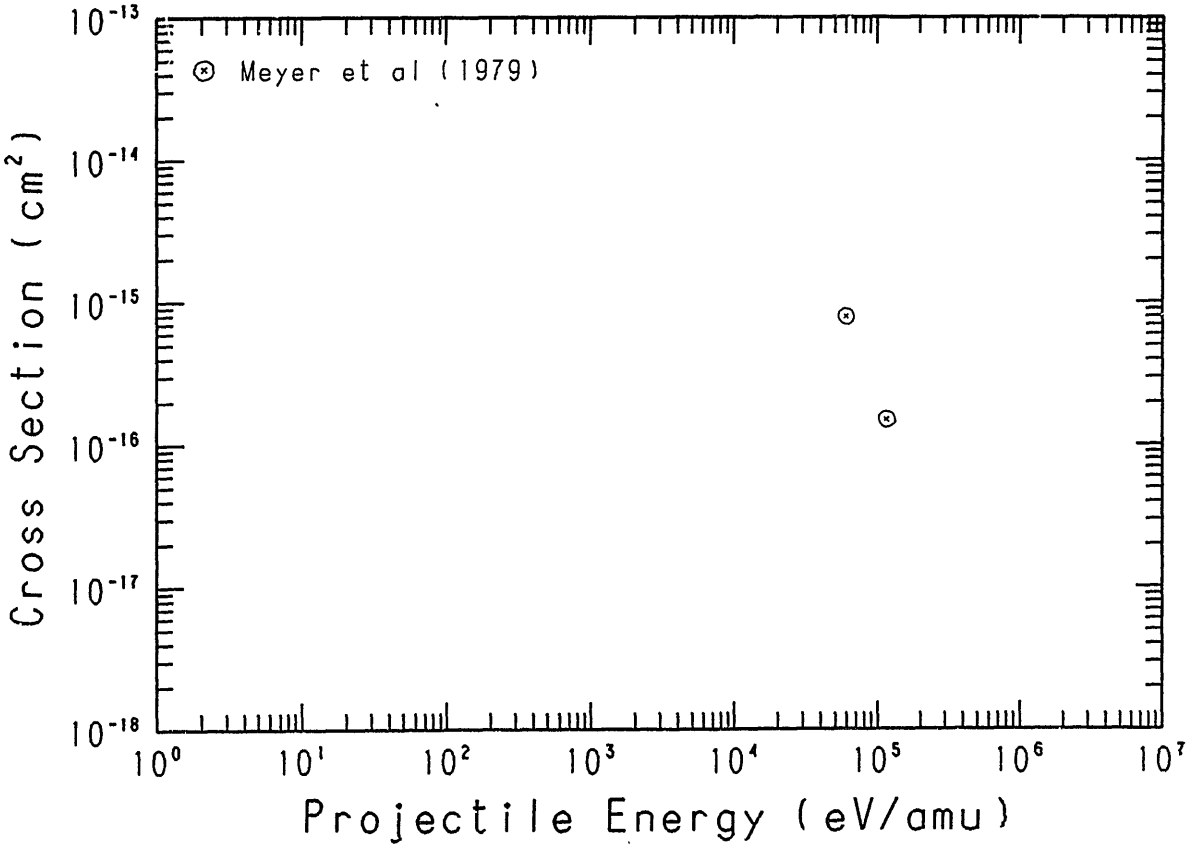


Fig. 65 $Fe^{5+} + H_2 \rightarrow Fe^{4+}$

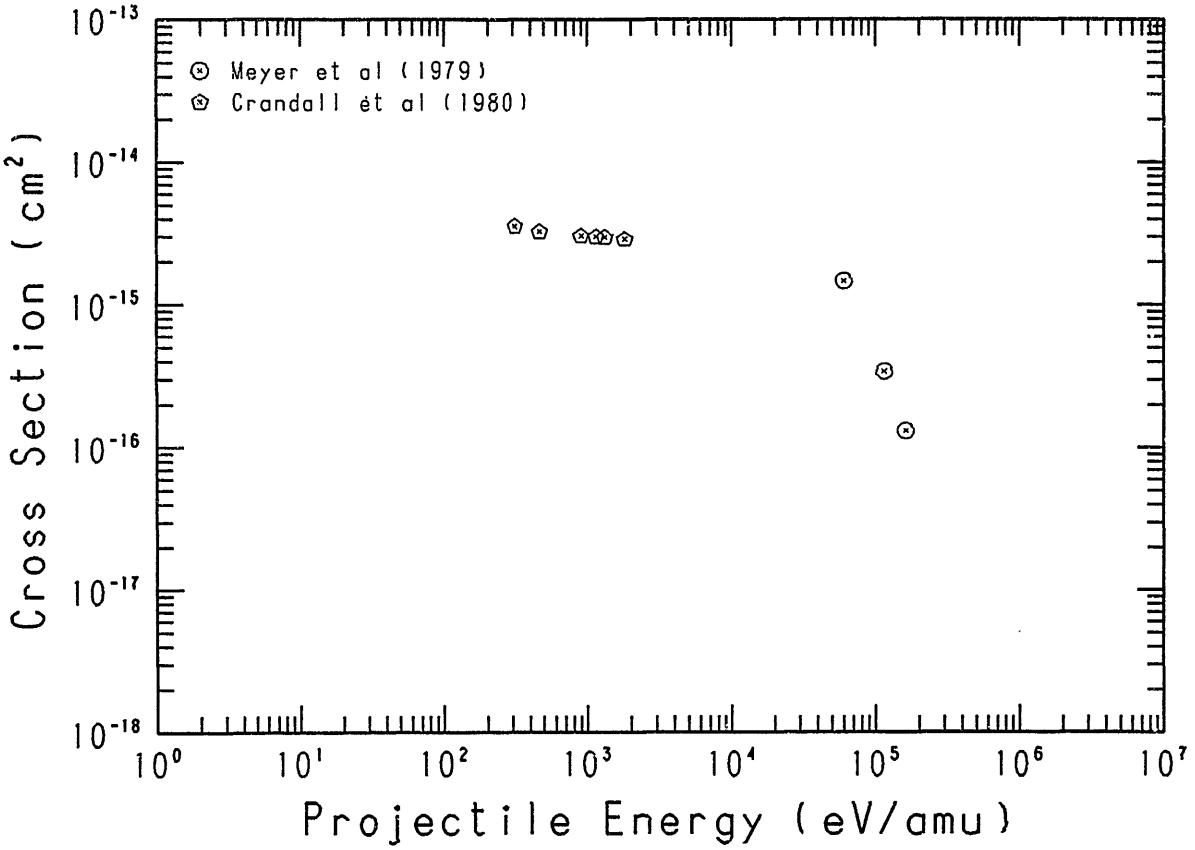


Fig. 66 $Fe^{6+} + H_2 \rightarrow Fe^{5+}$

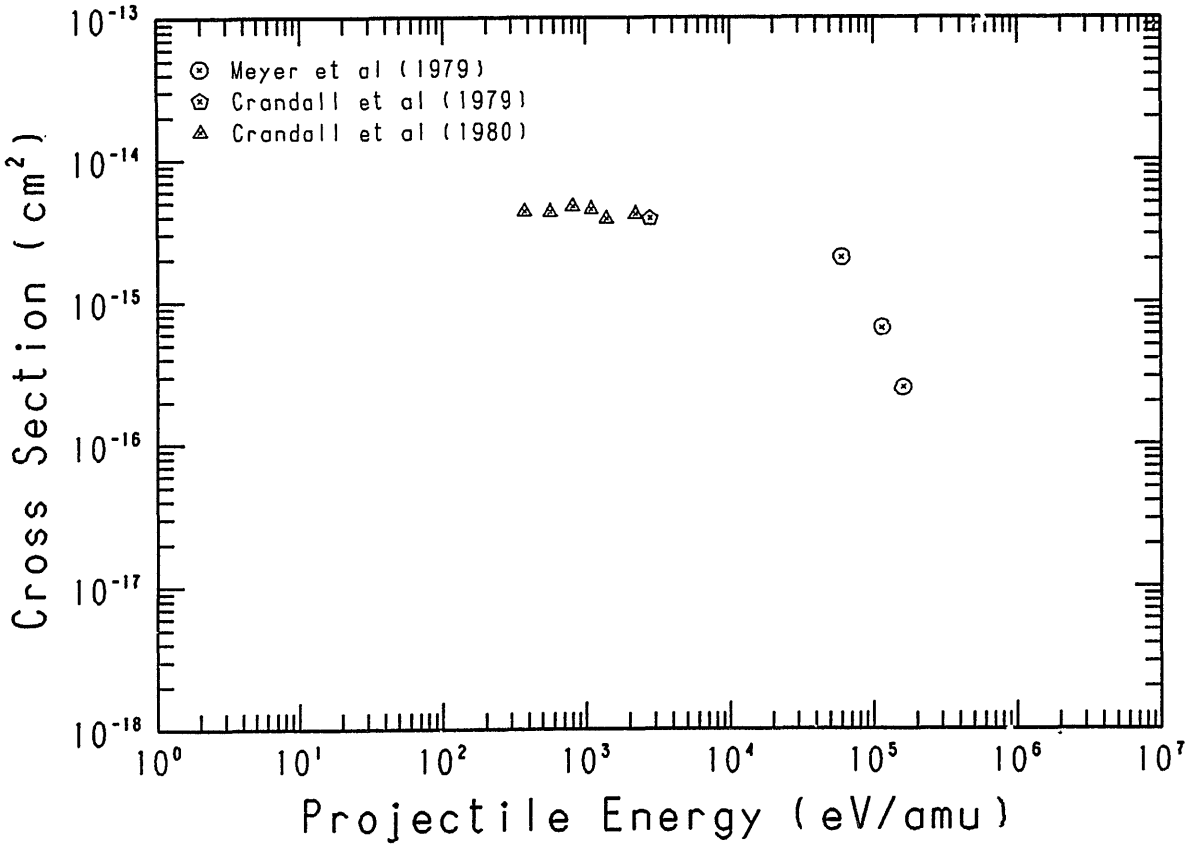


Fig. 67 $Fe^{7+} + H_2 \rightarrow Fe^{6+}$

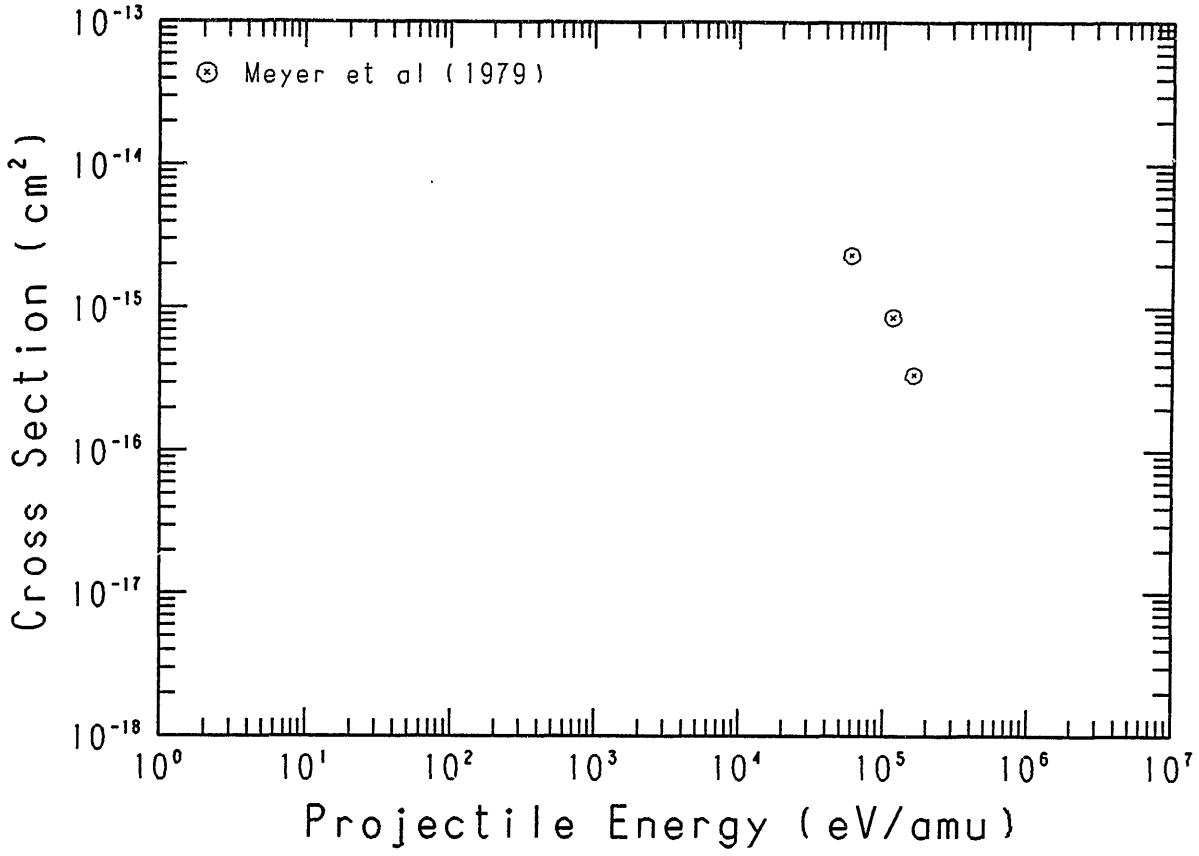


Fig. 68 $Fe^{8+} + H_2 \rightarrow Fe^{7+}$

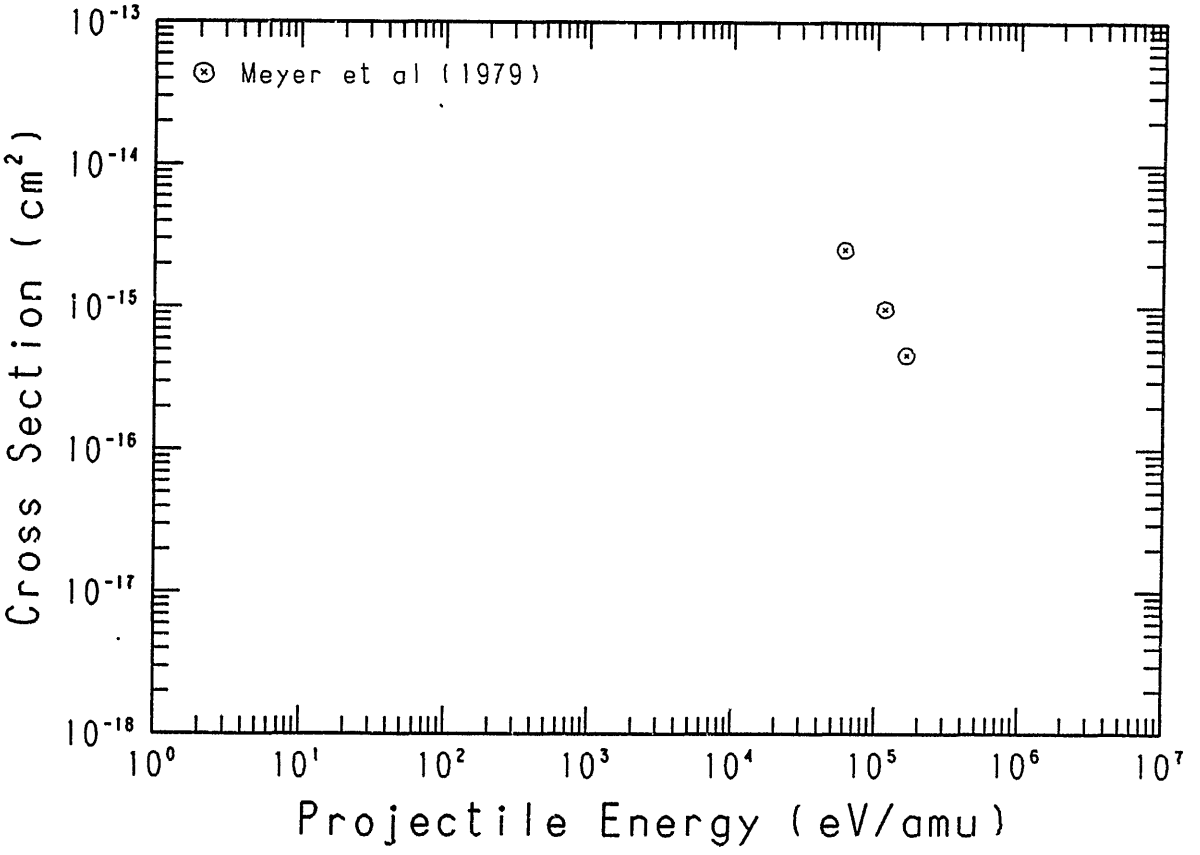


Fig. 69 $Fe^{9+} + H_2 \rightarrow Fe^{8+}$

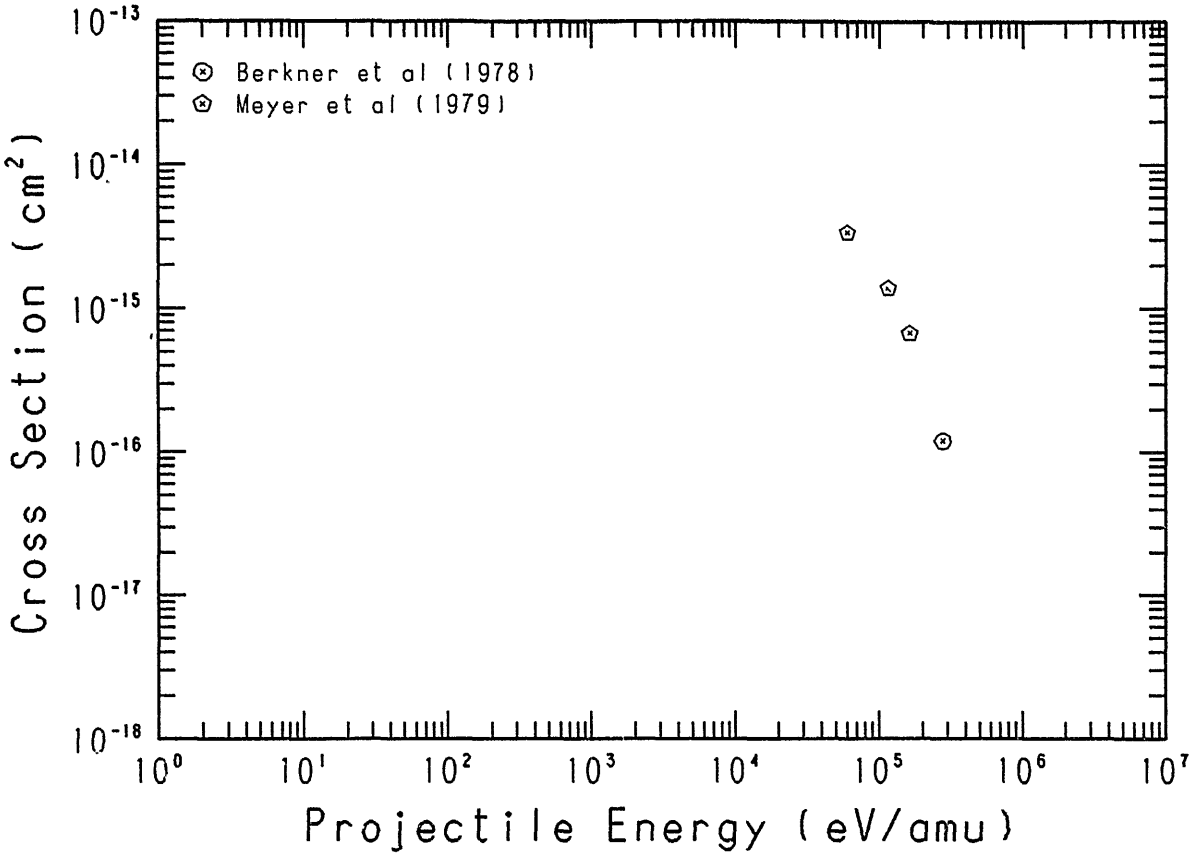


Fig. 70 $Fe^{10+} + H_2 \rightarrow Fe^{9+}$

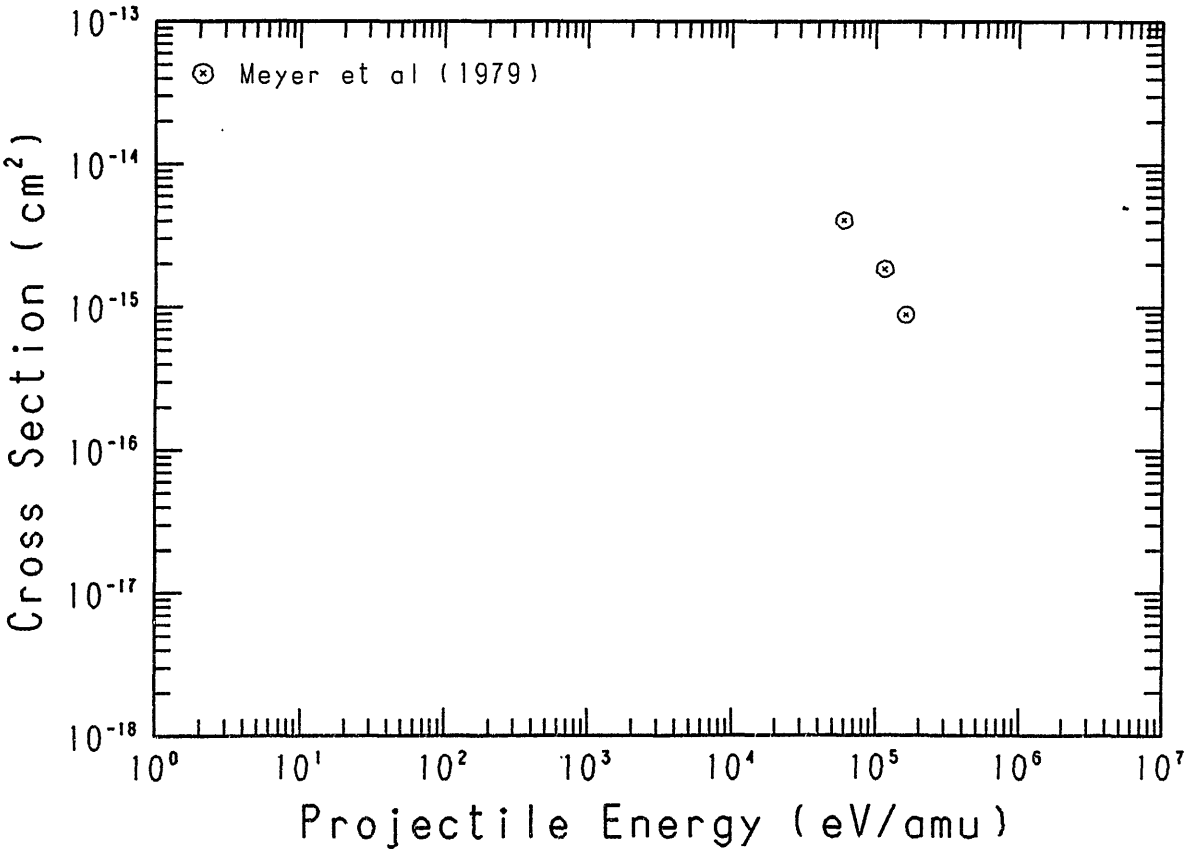


Fig. 71 $Fe^{11+} + H_2 \rightarrow Fe^{10+}$

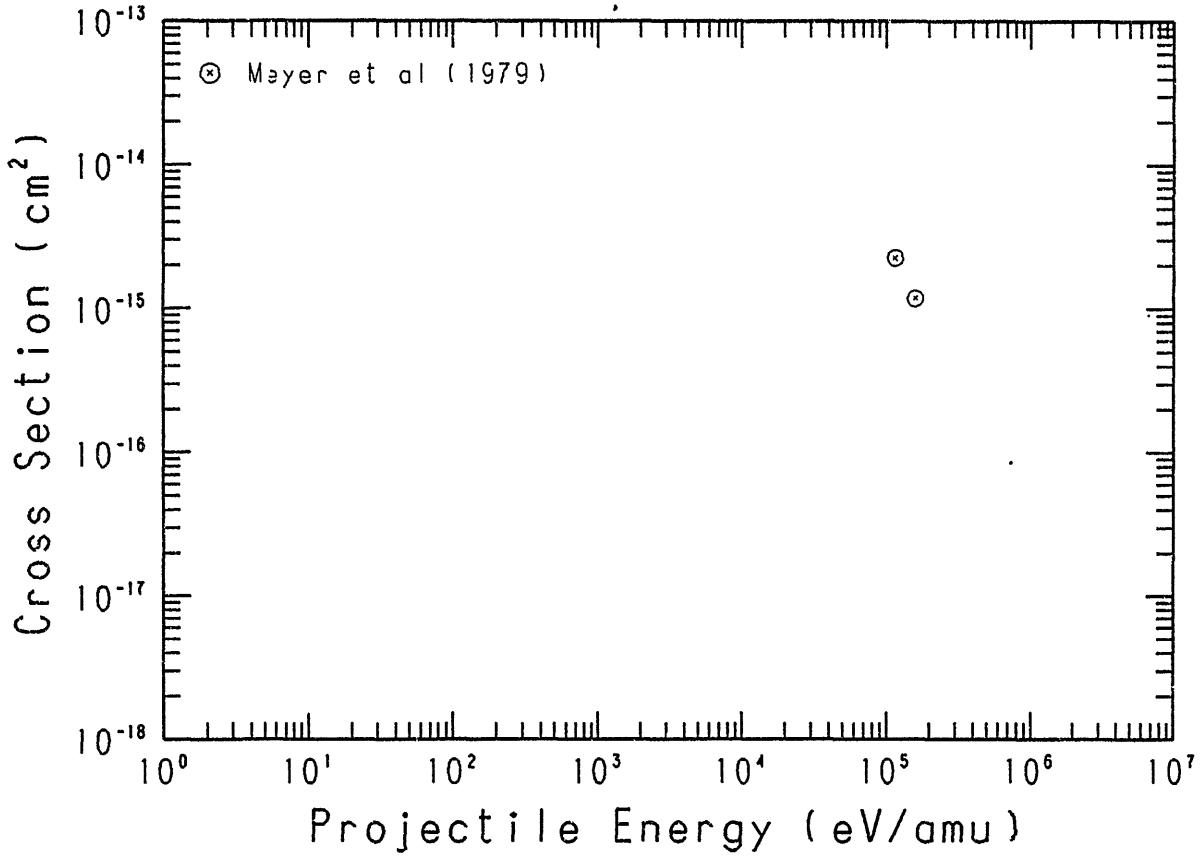


Fig. 72 $Fe^{12+} + H_2 \rightarrow Fe^{11+}$

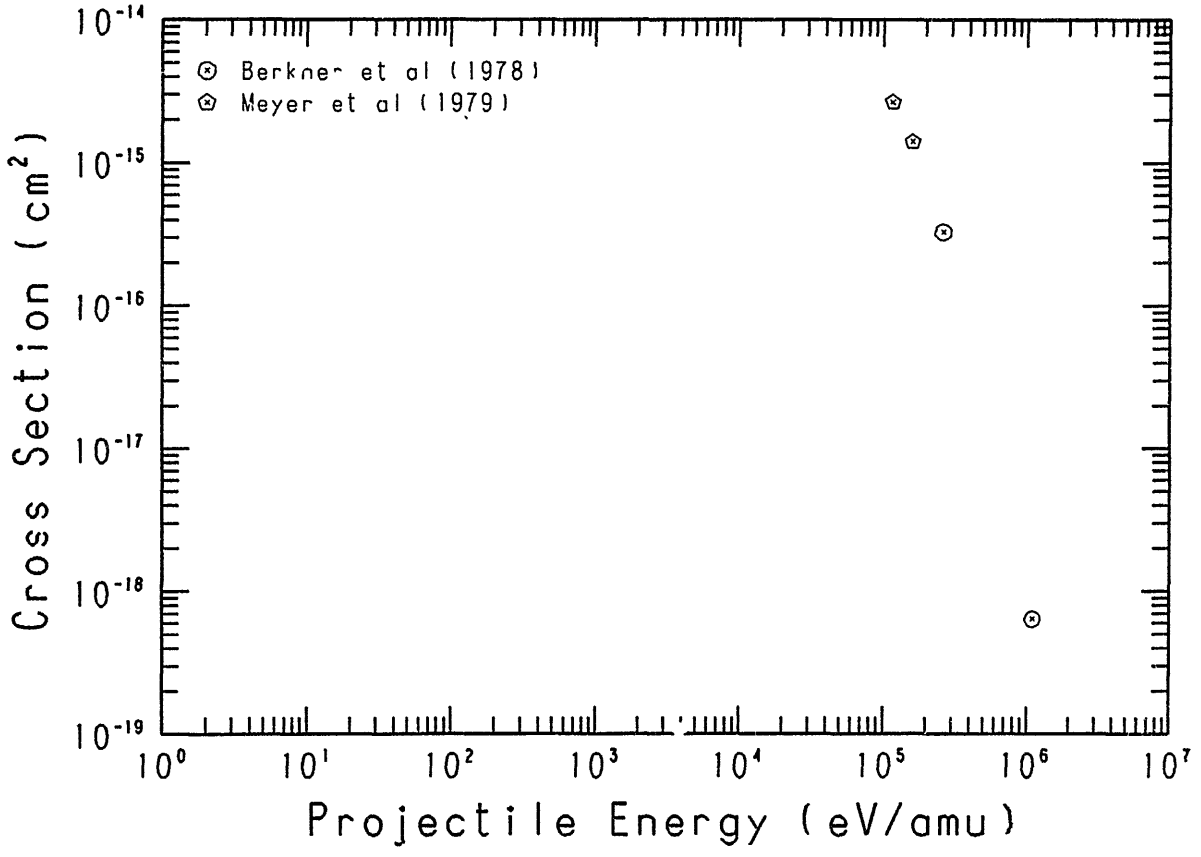


Fig. 73 $Fe^{13+} + H_2 \rightarrow Fe^{12+}$

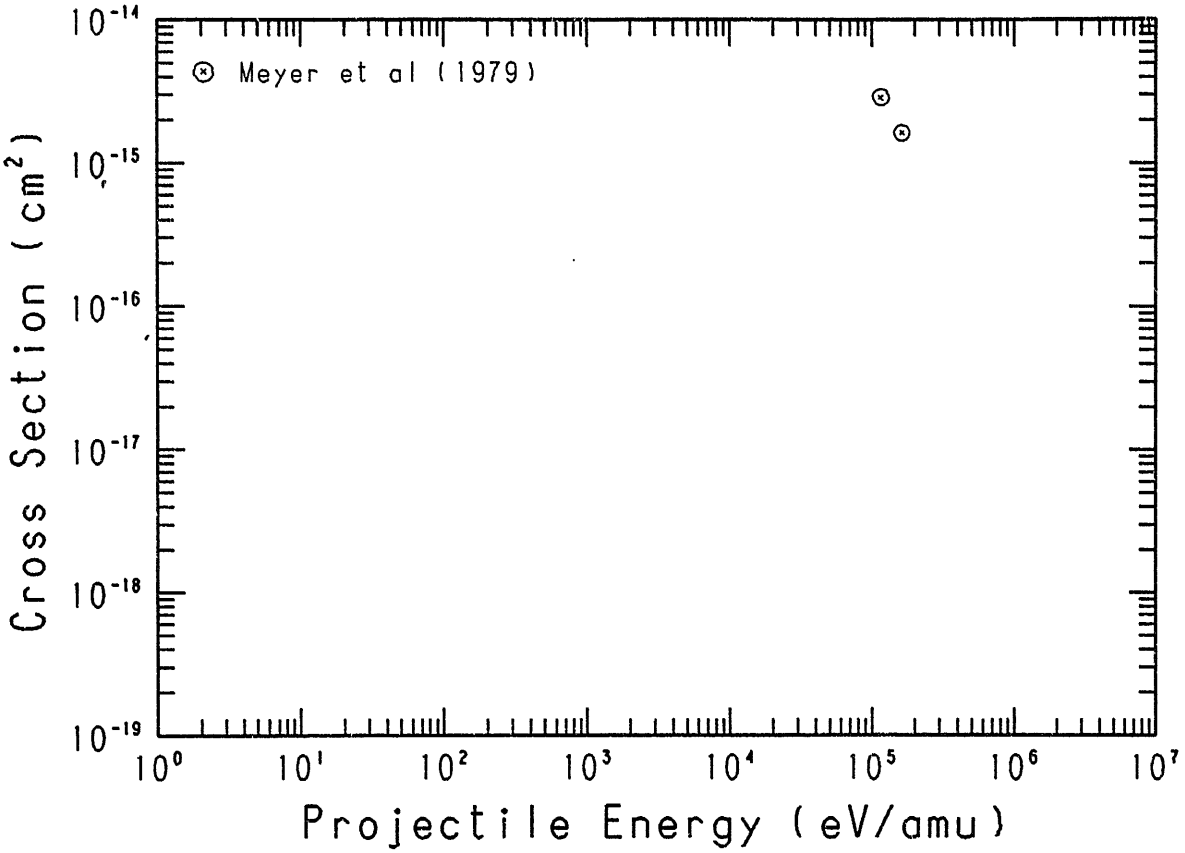


Fig. 74 $Fe^{14+} + H_2 \rightarrow Fe^{13+}$

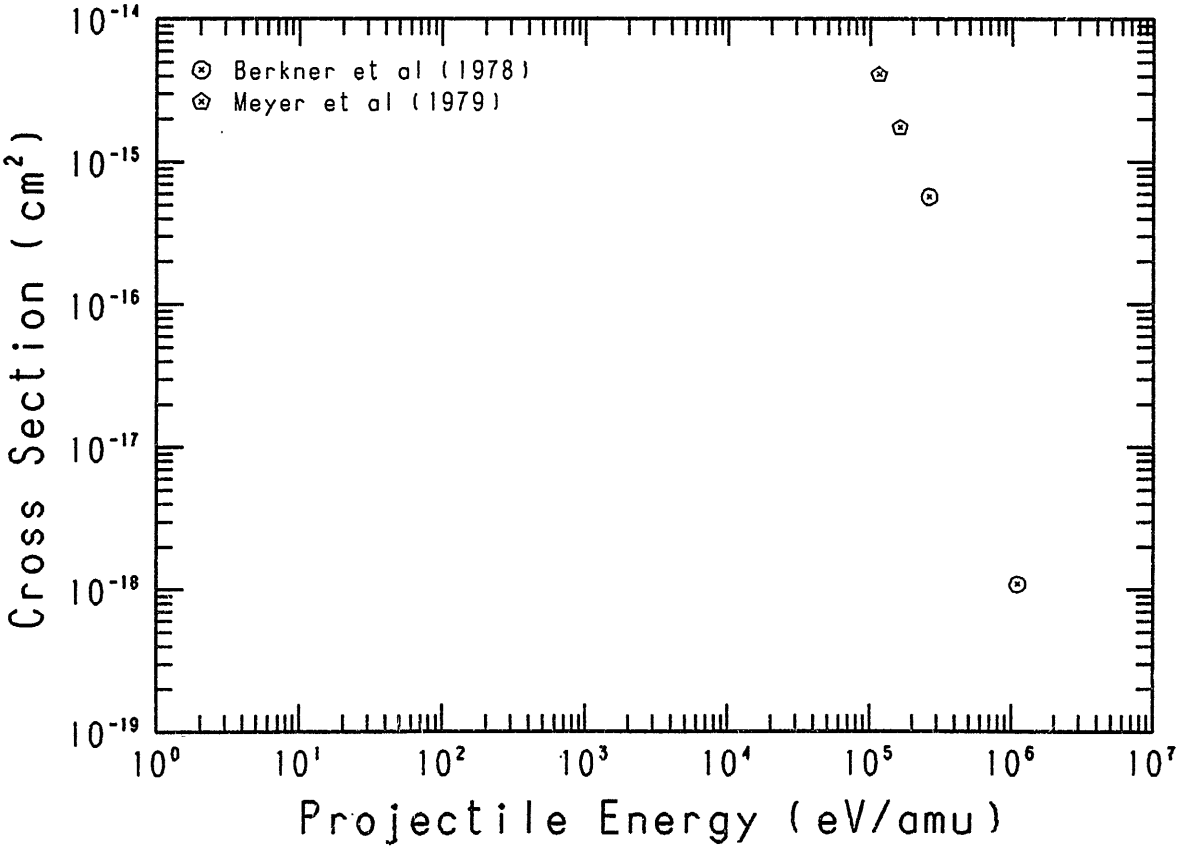


Fig. 75 $Fe^{15+} + H_2 \rightarrow Fe^{14+}$

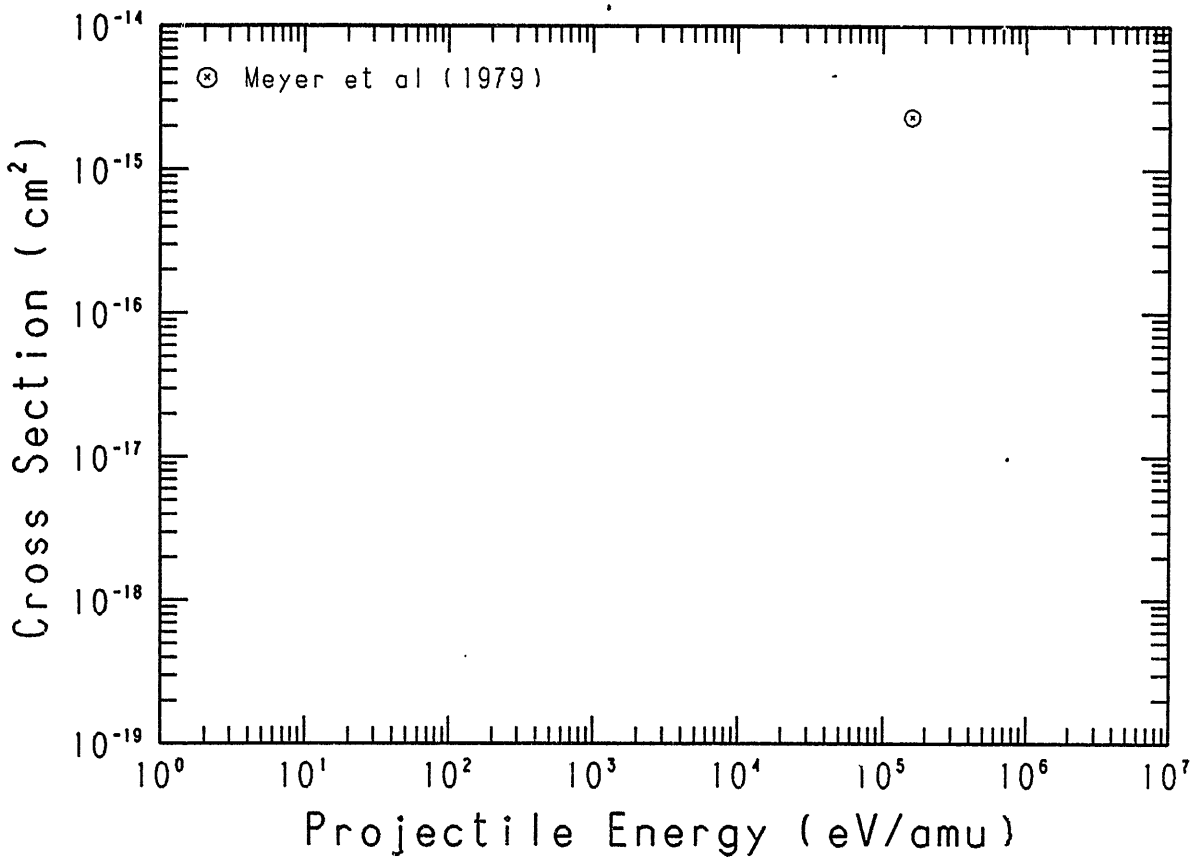


Fig. 76 $Fe^{16+} + H_2 \rightarrow Fe^{15+}$

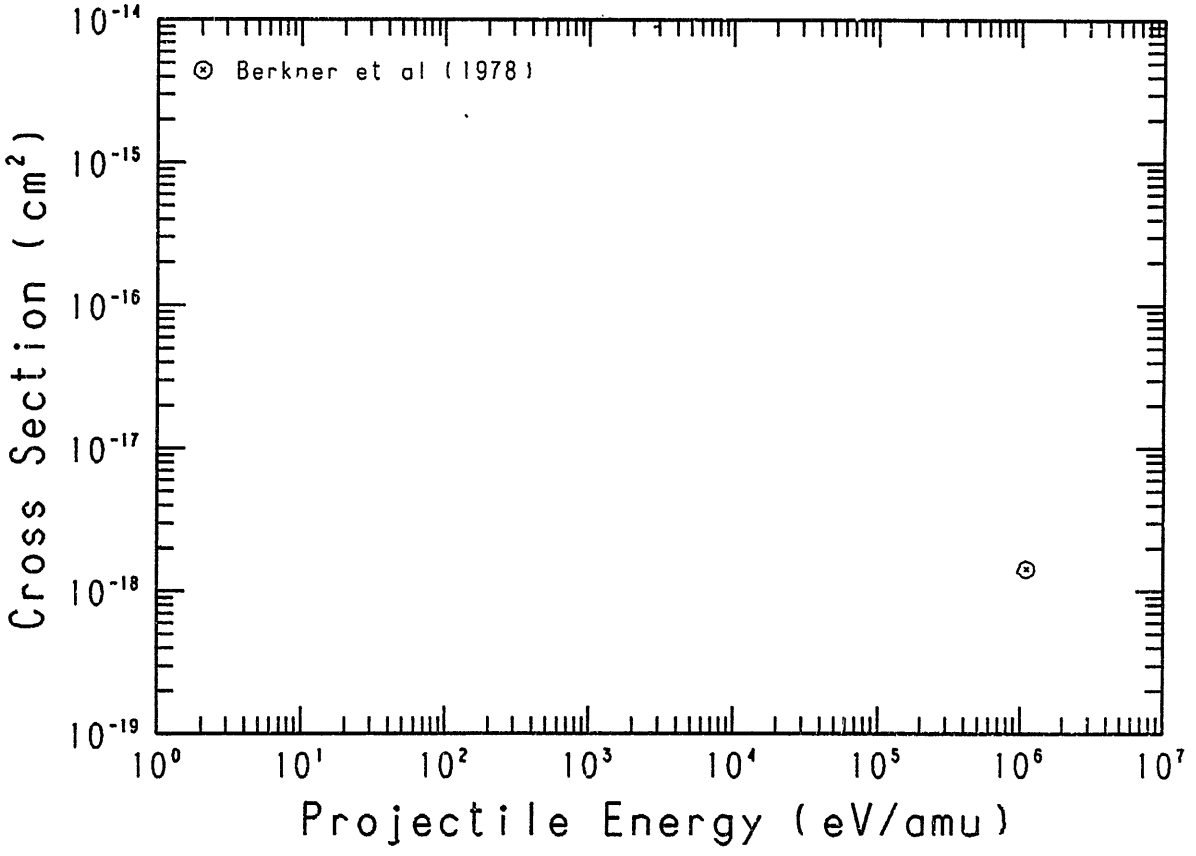


Fig. 77 $Fe^{18+} + H_2 \rightarrow Fe^{17+}$

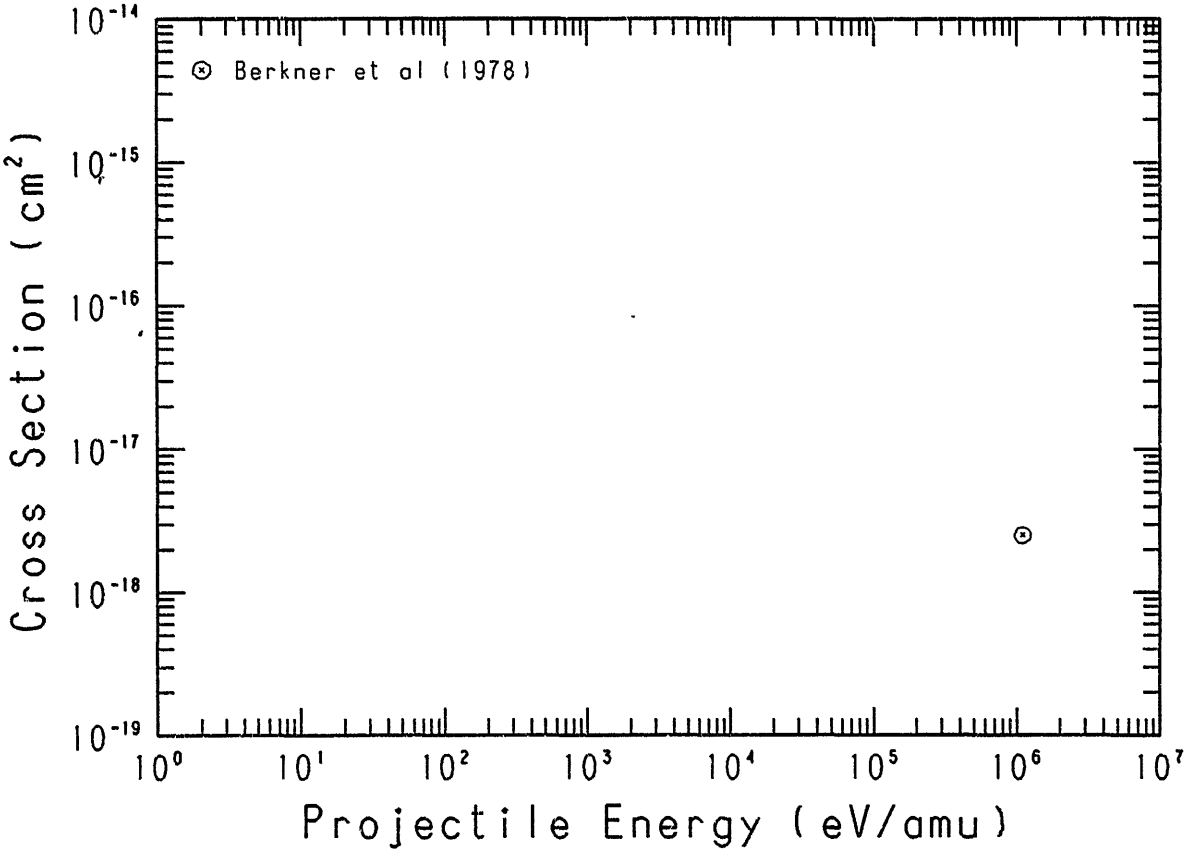


Fig. 78 $Fe^{20+} + H_2 \rightarrow Fe^{19+}$

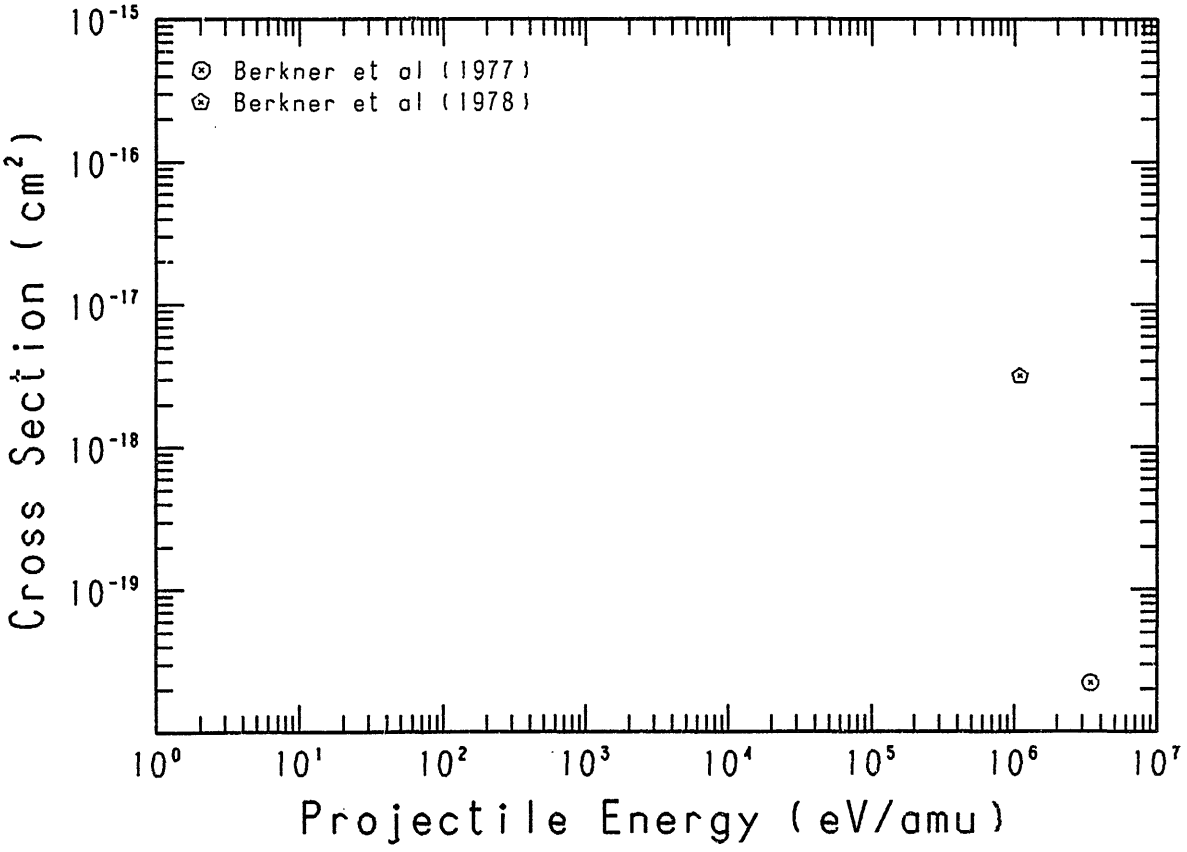


Fig. 79 $Fe^{21+} + H_2 \rightarrow Fe^{20+}$

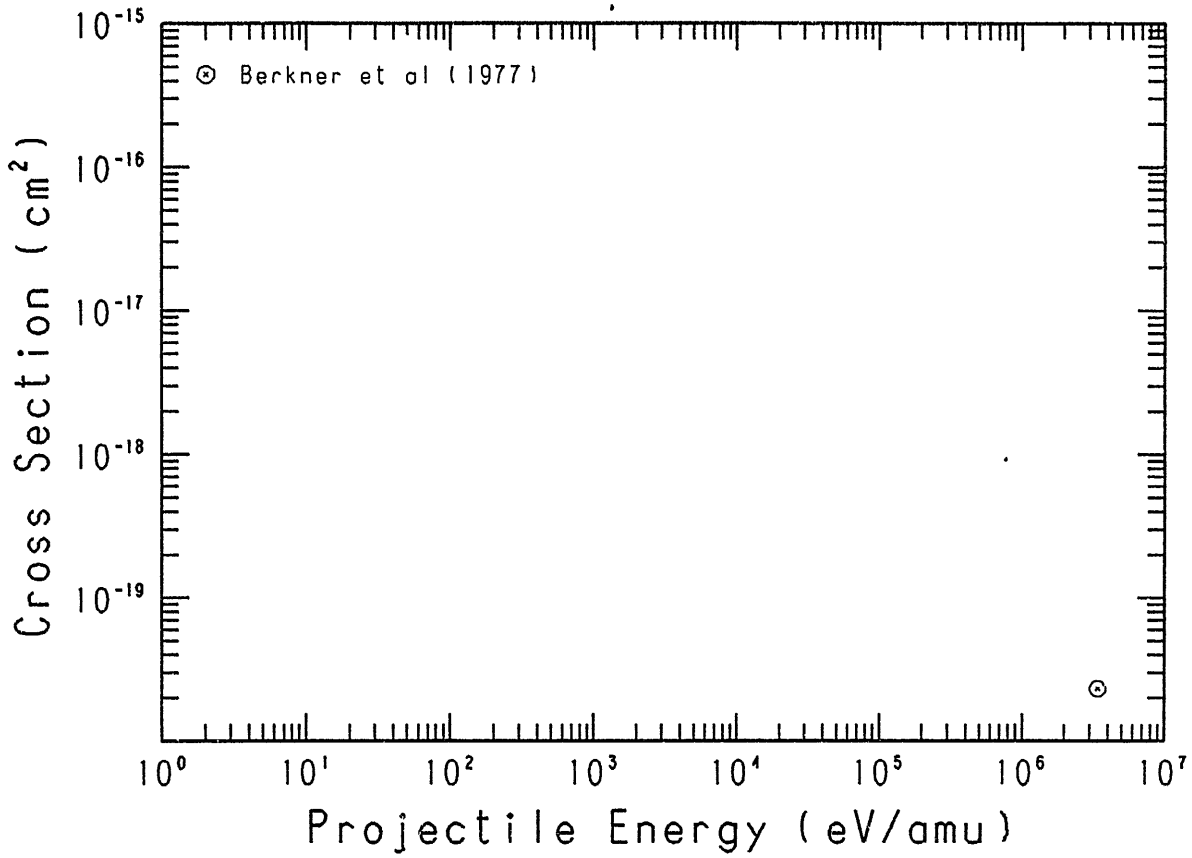


Fig. 80 $Fe^{22+} + H_2 \rightarrow Fe^{21+}$

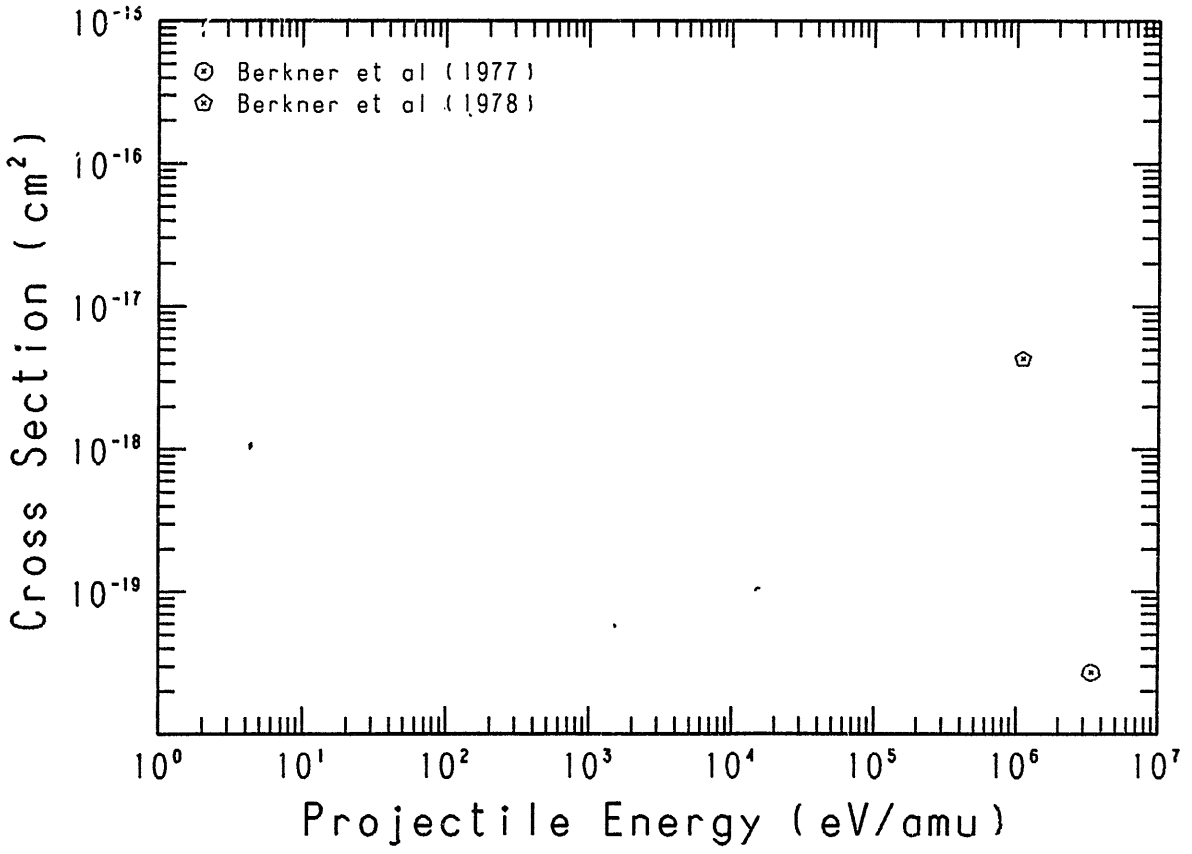


Fig. 81 $Fe^{23+} + H_2 \rightarrow Fe^{22+}$

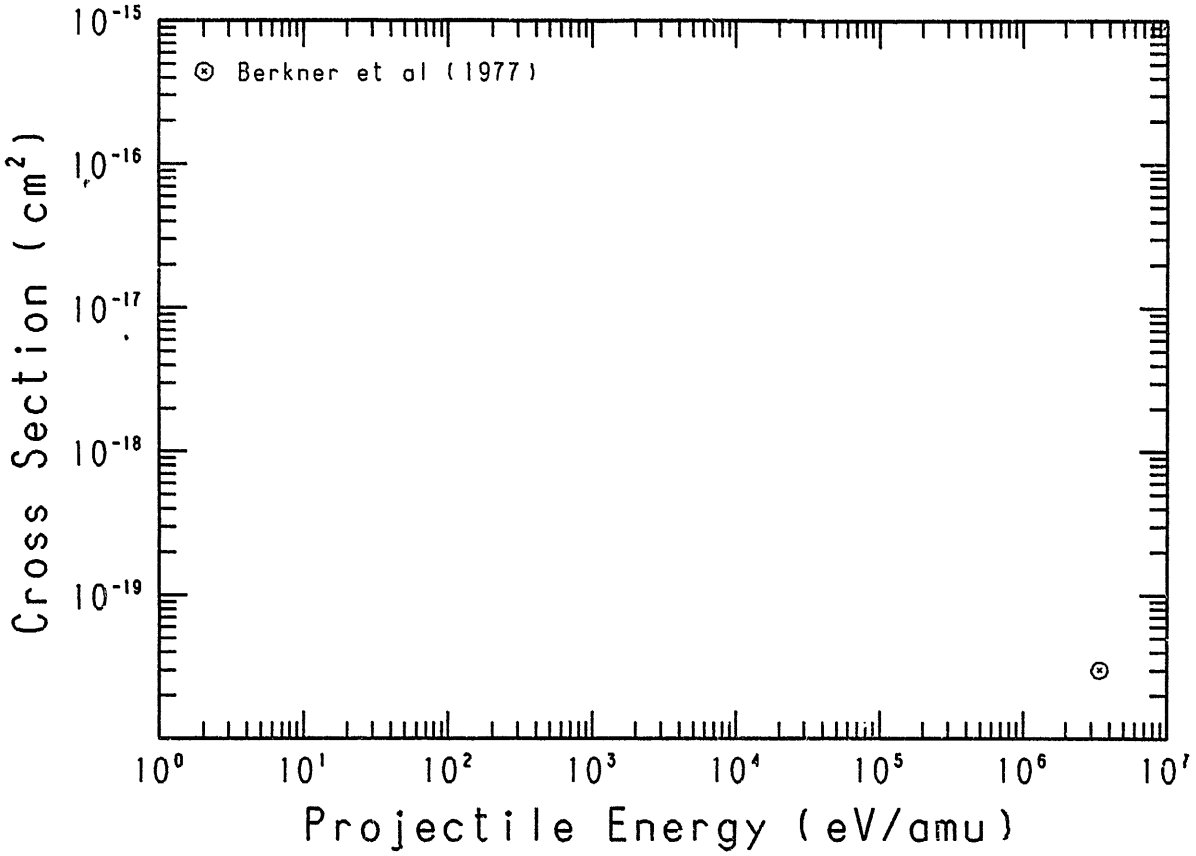


Fig. 82 $Fe^{24+} + H_2 \rightarrow Fe^{23+}$

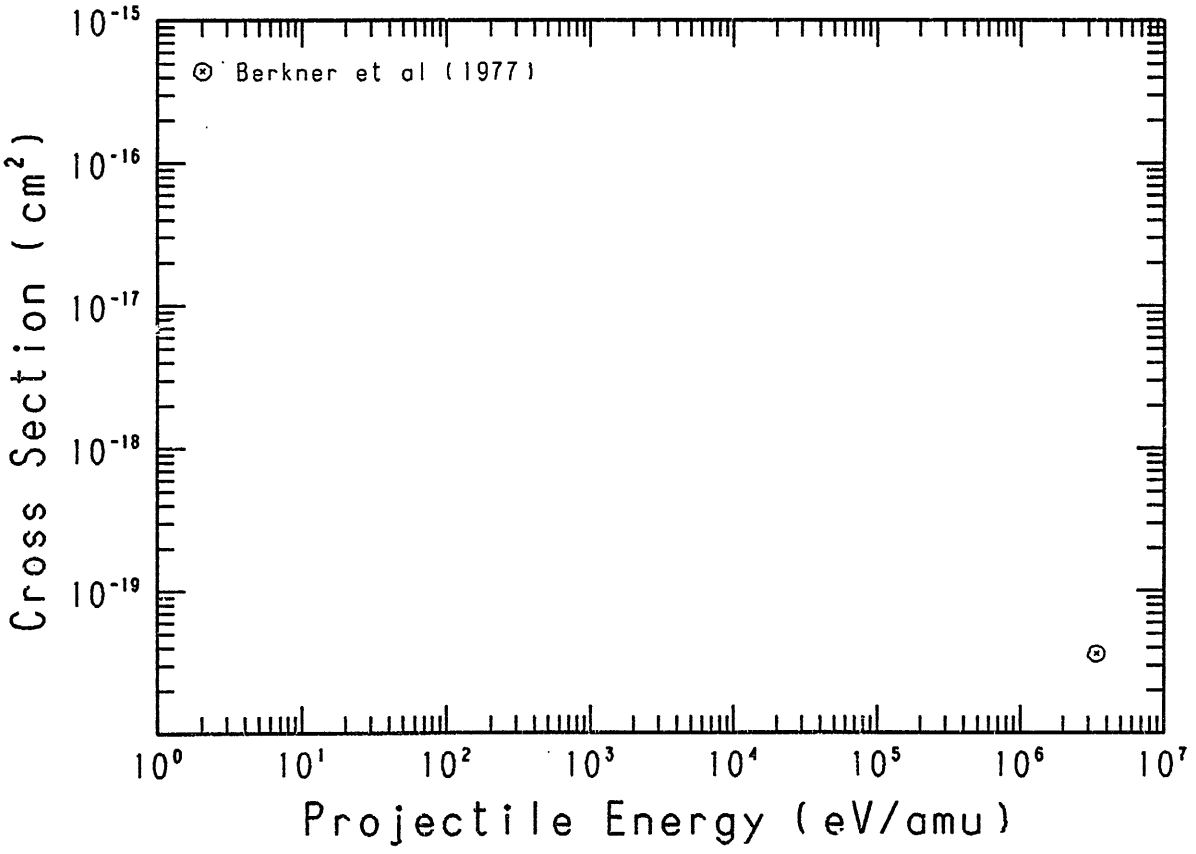


Fig. 83 $Fe^{25+} + H_2 \rightarrow Fe^{24+}$

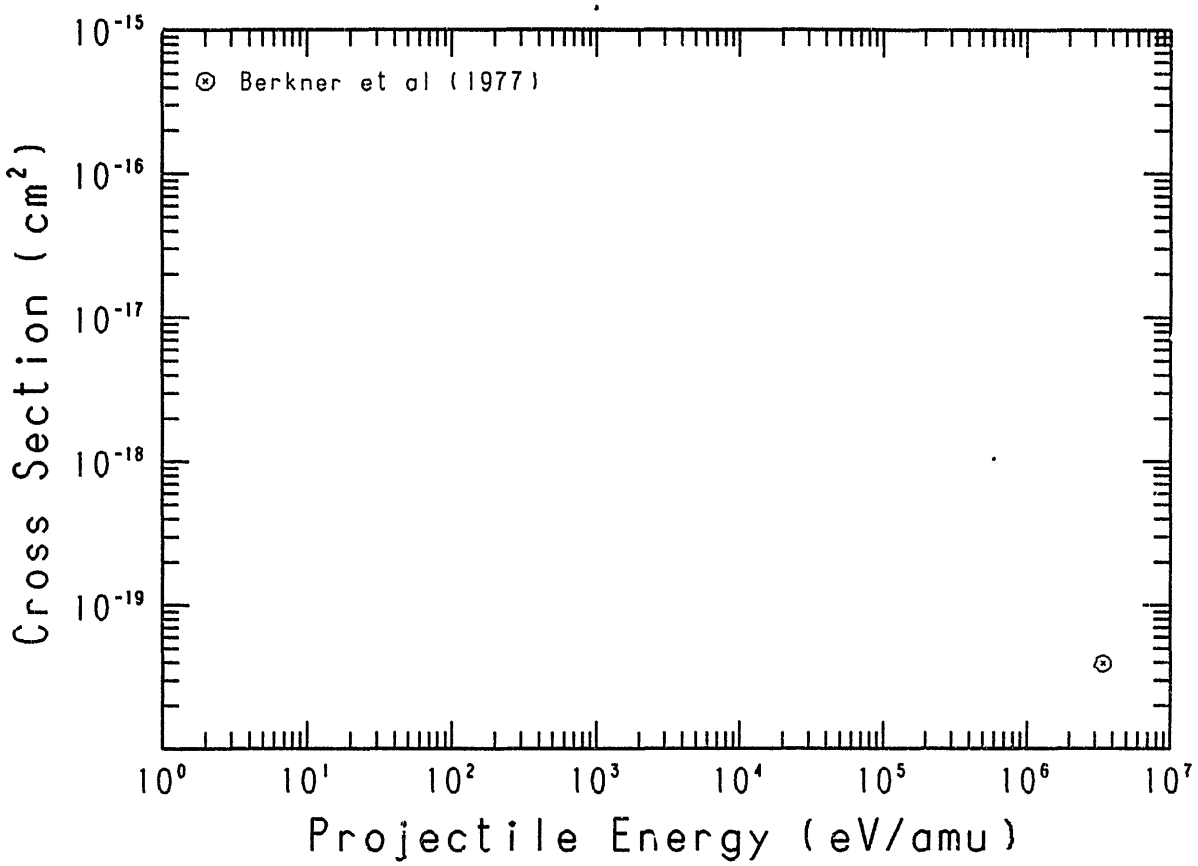


Fig. 84 $Zn^{2+} + H_2 \rightarrow Zn^{+}$

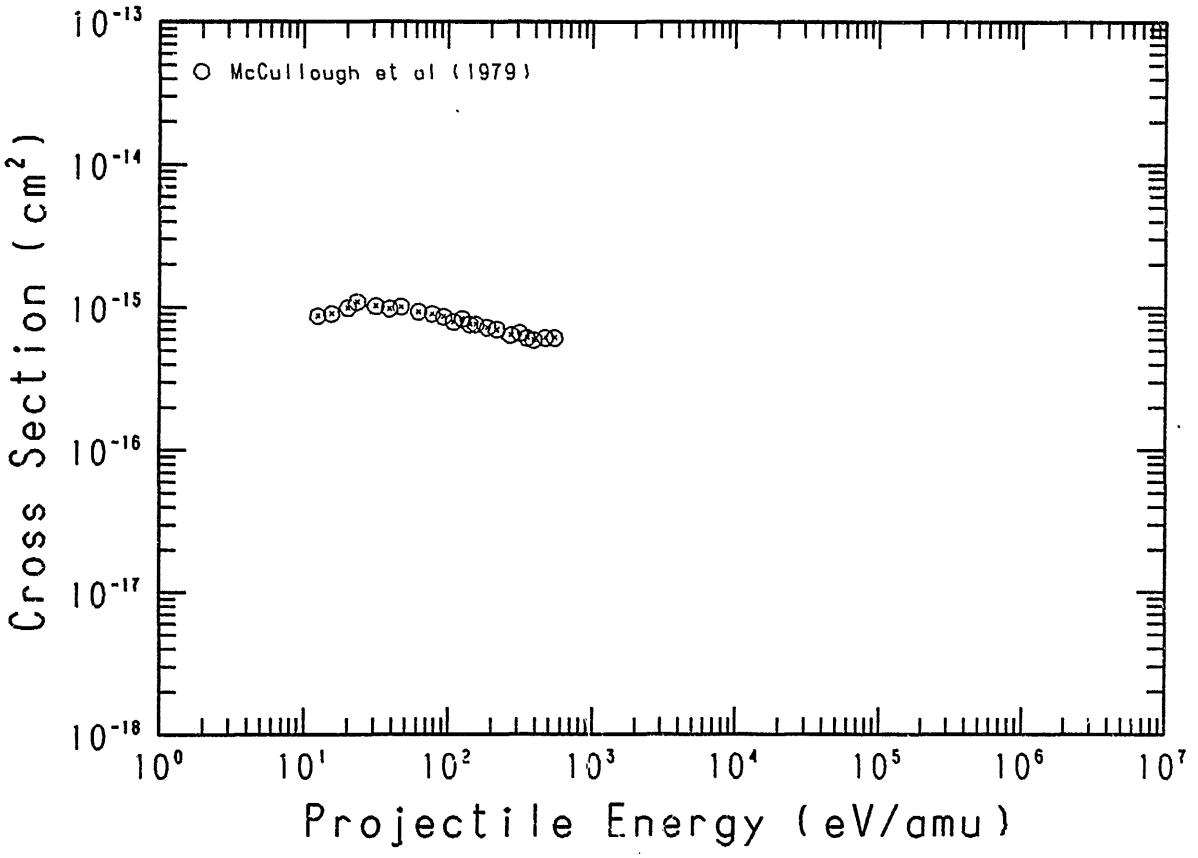


Fig. 85 $Br^{3+} + H_2 \rightarrow Br^{2+}$

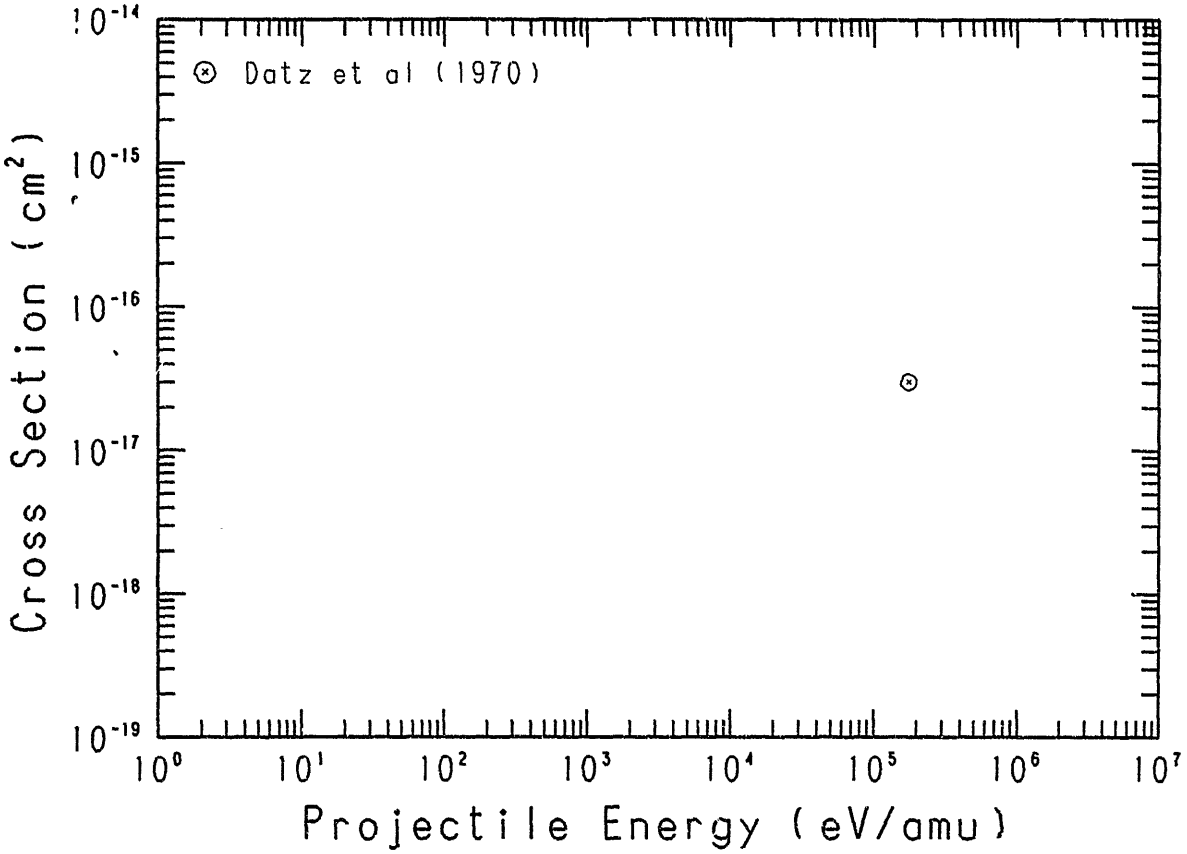


Fig. 86 $Br^{4+} + H_2 \rightarrow Br^{3+}$

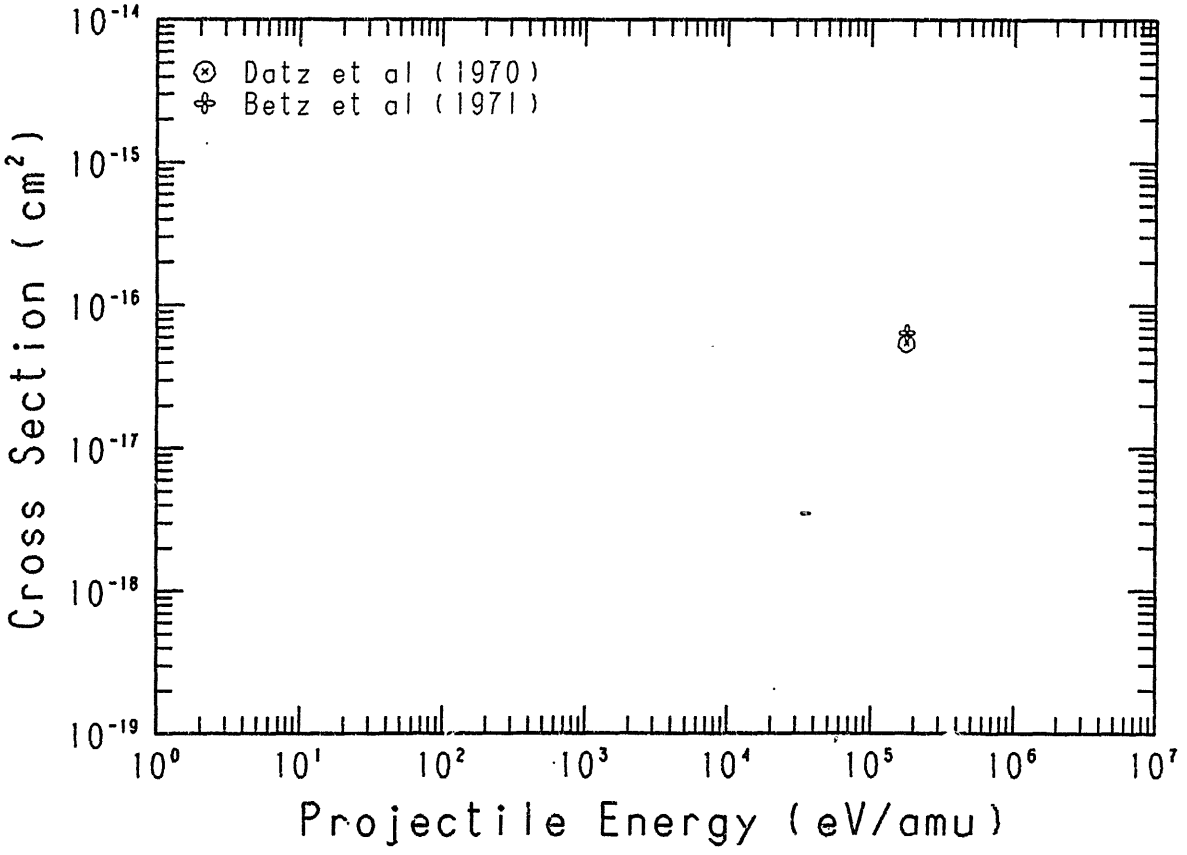


Fig. 87 $Br^{5+} + H_2 \rightarrow Br^{4+}$

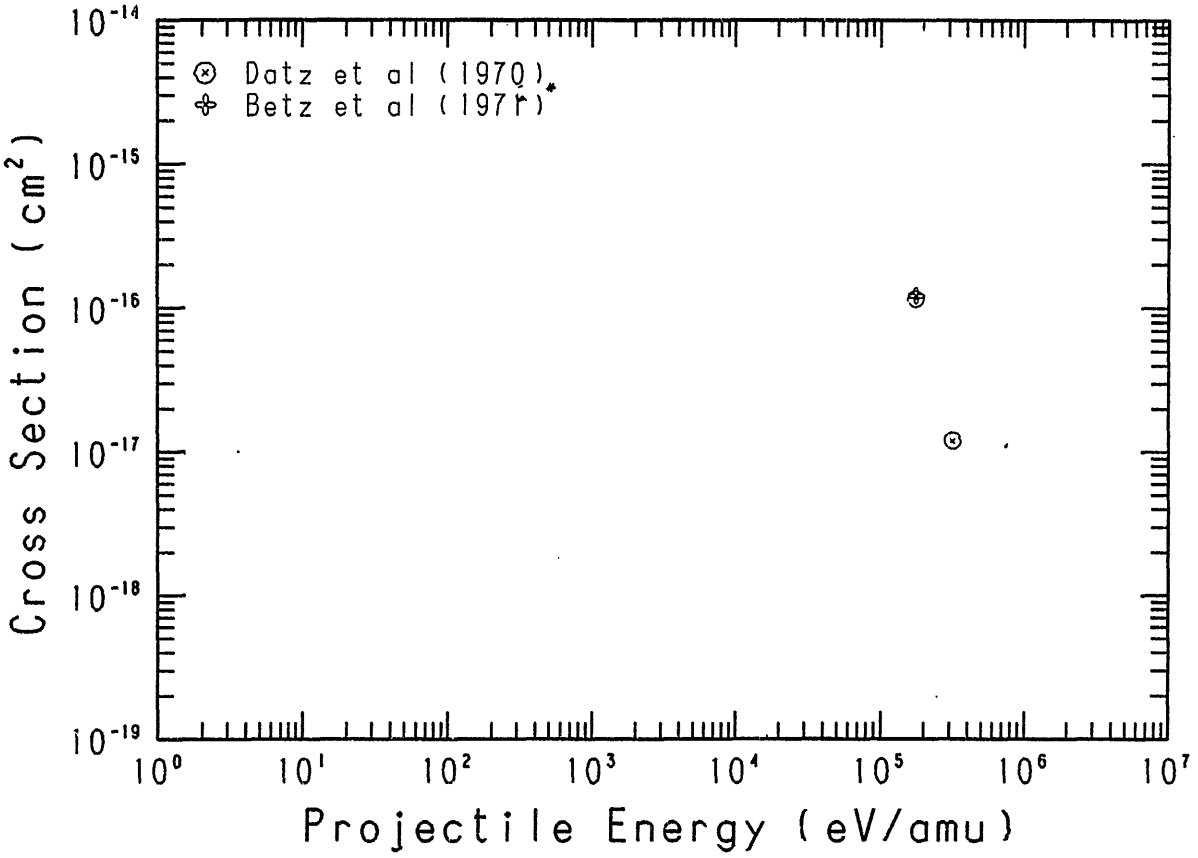


Fig. 88 $Br^{6+} + H_2 \rightarrow Br^{4+}$

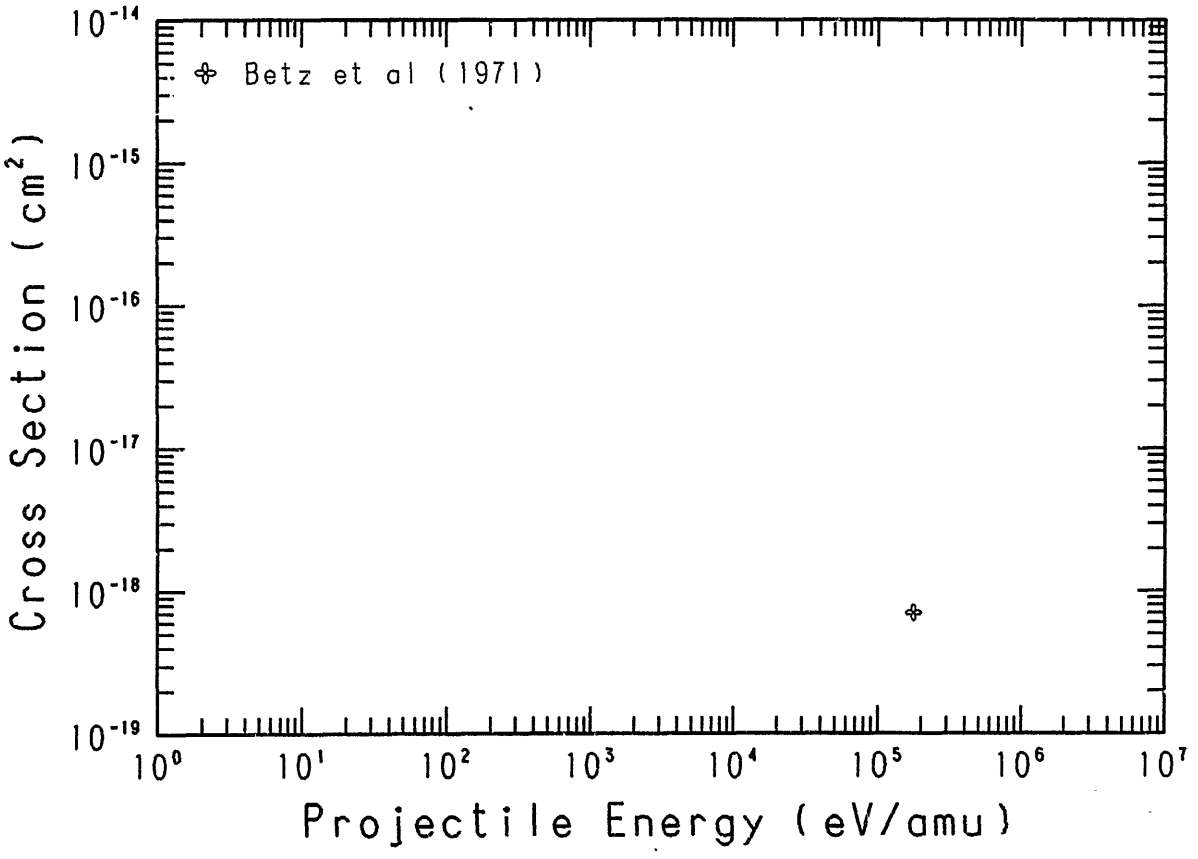


Fig. 89 $Br^{6+} + H_2 \rightarrow Br^{5+}$

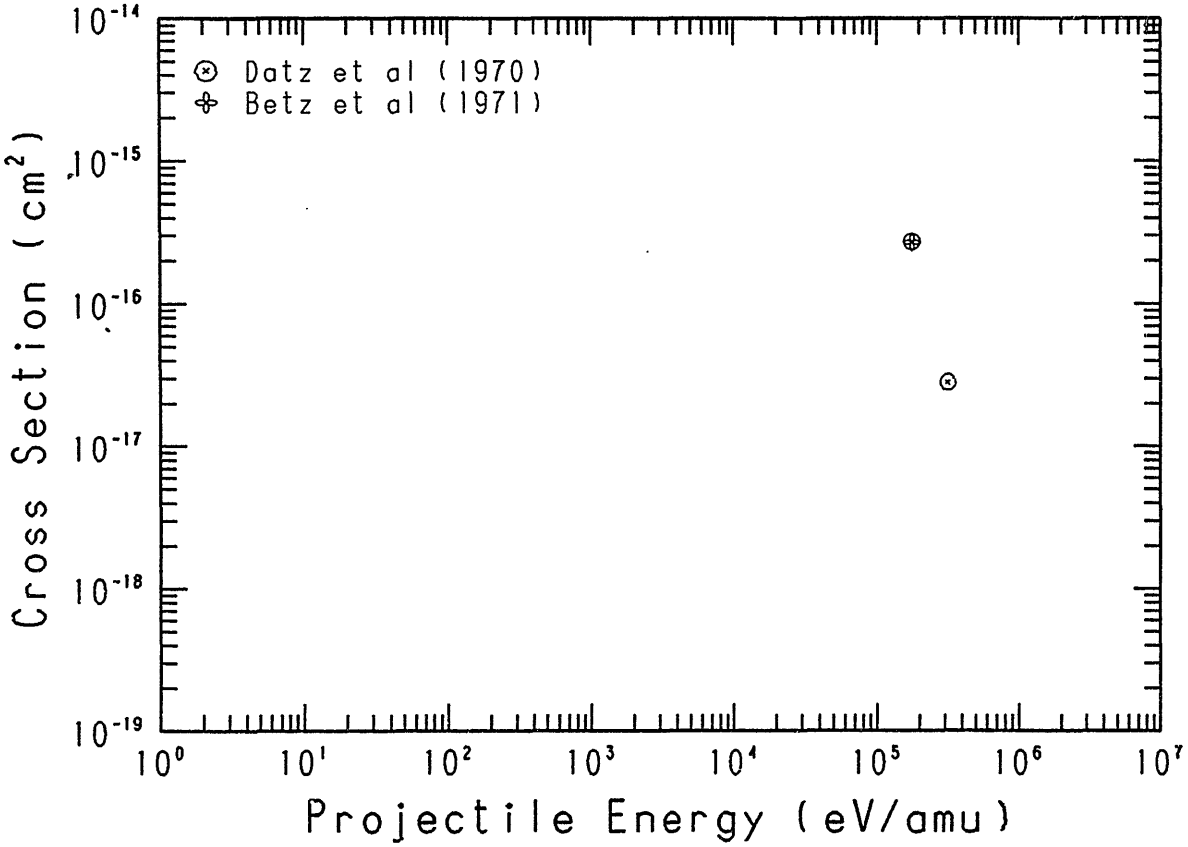


Fig. 90 $Br^{7+} + H_2 \rightarrow Br^{5+}$

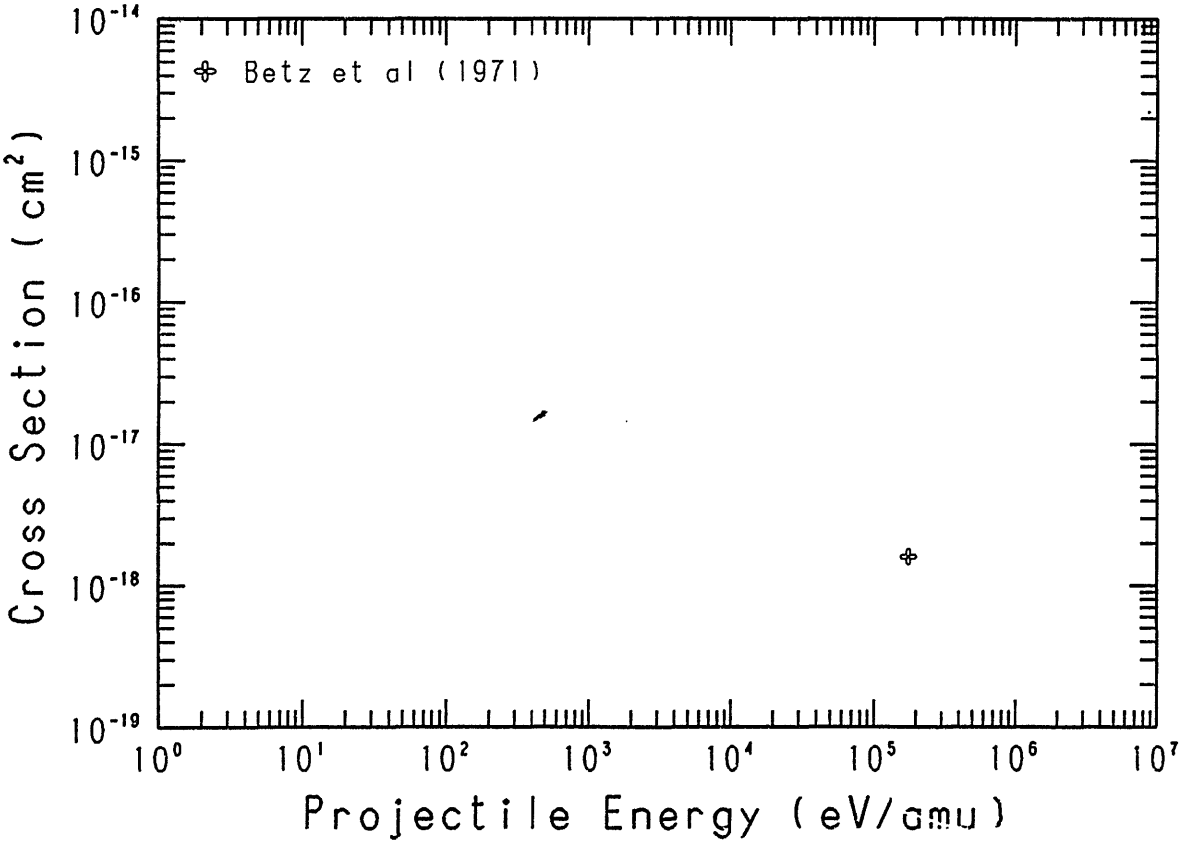


Fig. 91 $Br^{7+} + H_2 \rightarrow Br^{6+}$

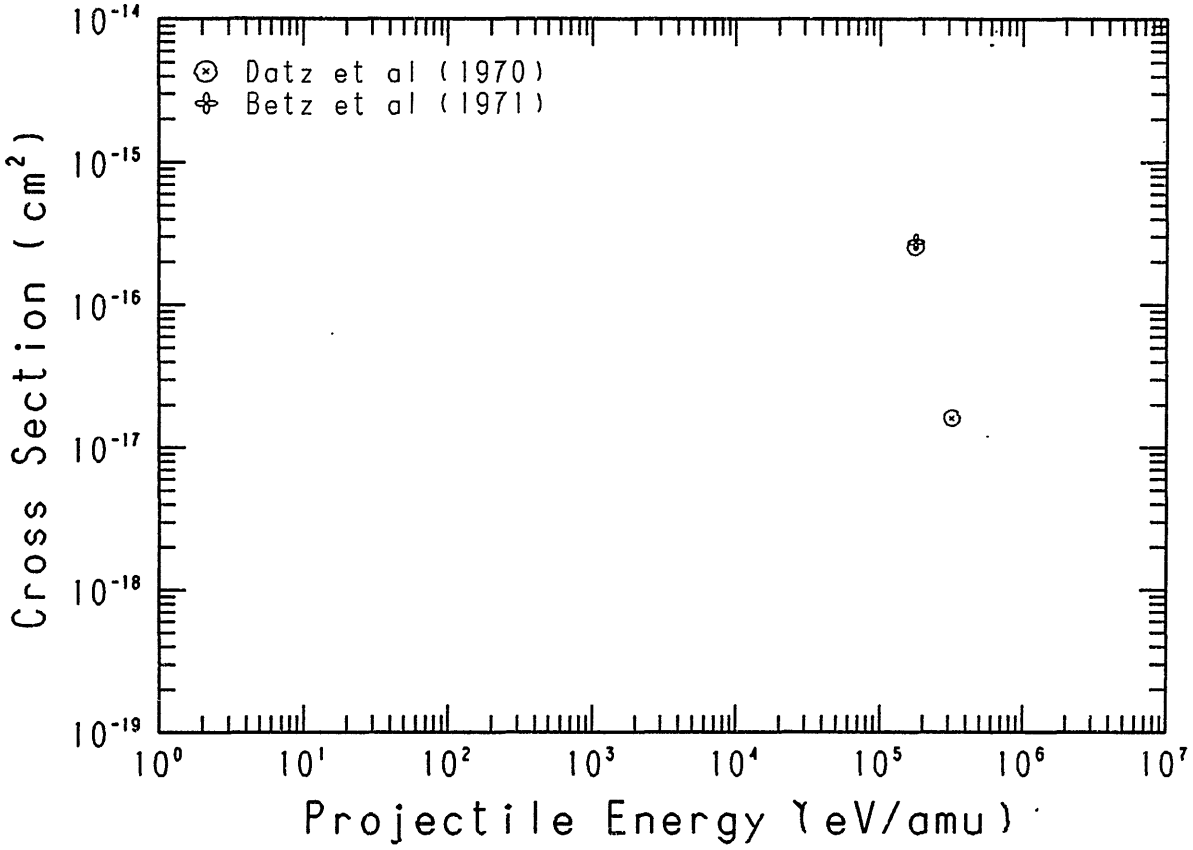


Fig. 92 $Br^{8+} + H_2 \rightarrow Br^{6+}$

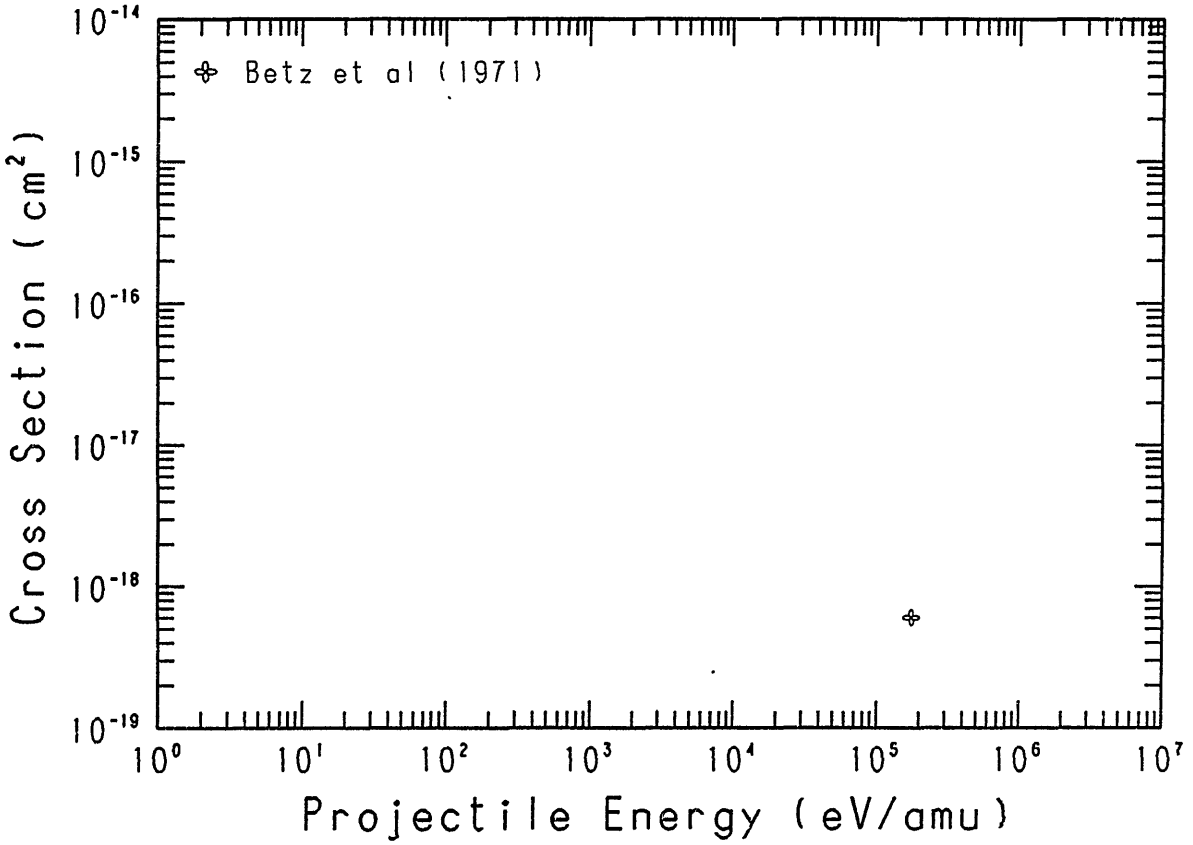


Fig. 93 $Br^{8+} + H_2 \rightarrow Br^{7+}$

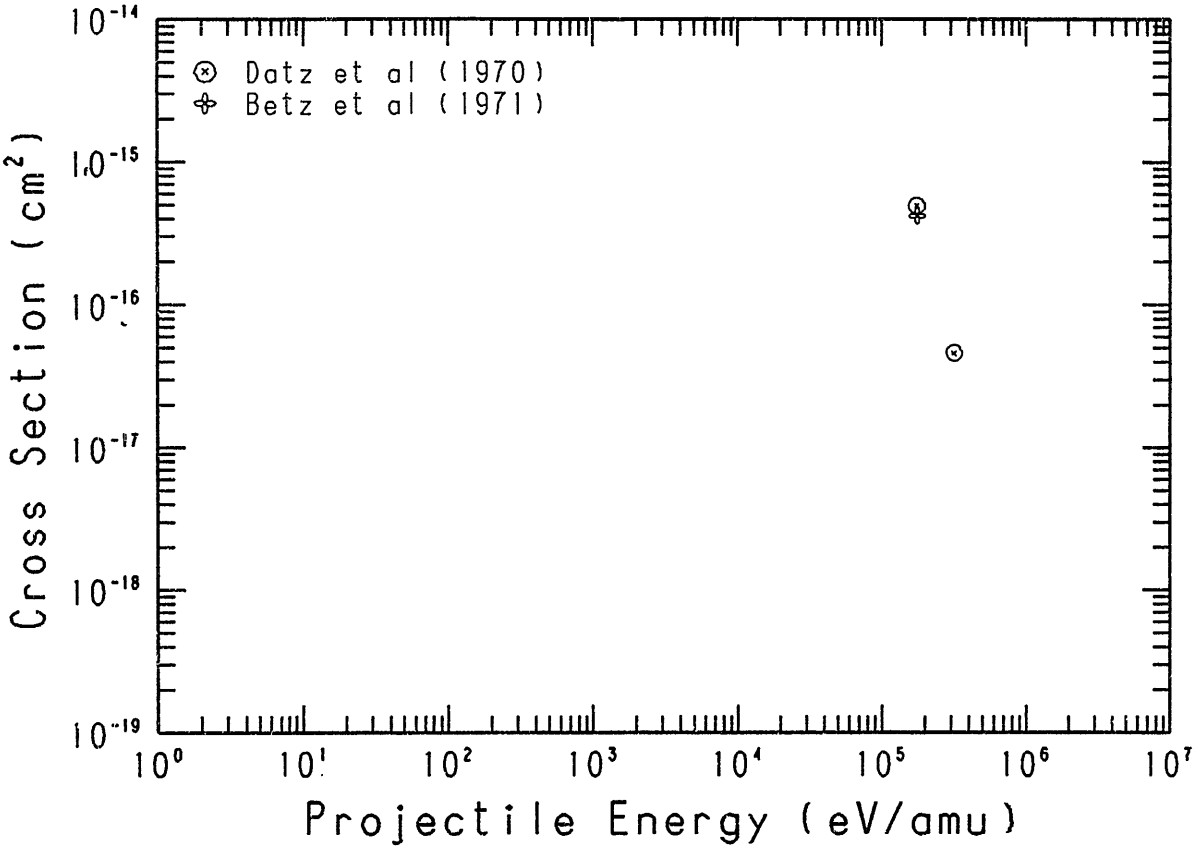


Fig. 94 $Br^{9+} + H_2 \rightarrow Br^{8+}$

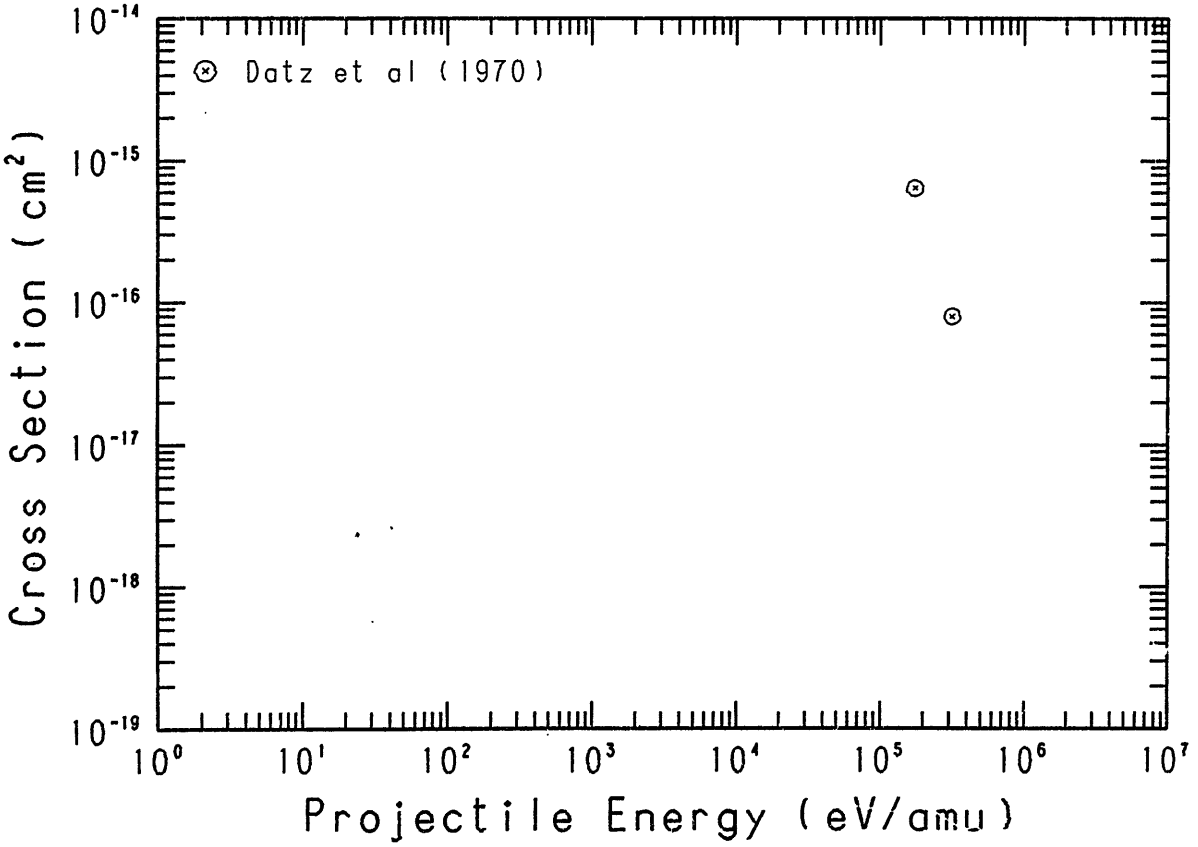


Fig. 95 $Br^{10+} + H_2 \rightarrow Br^{9+}$

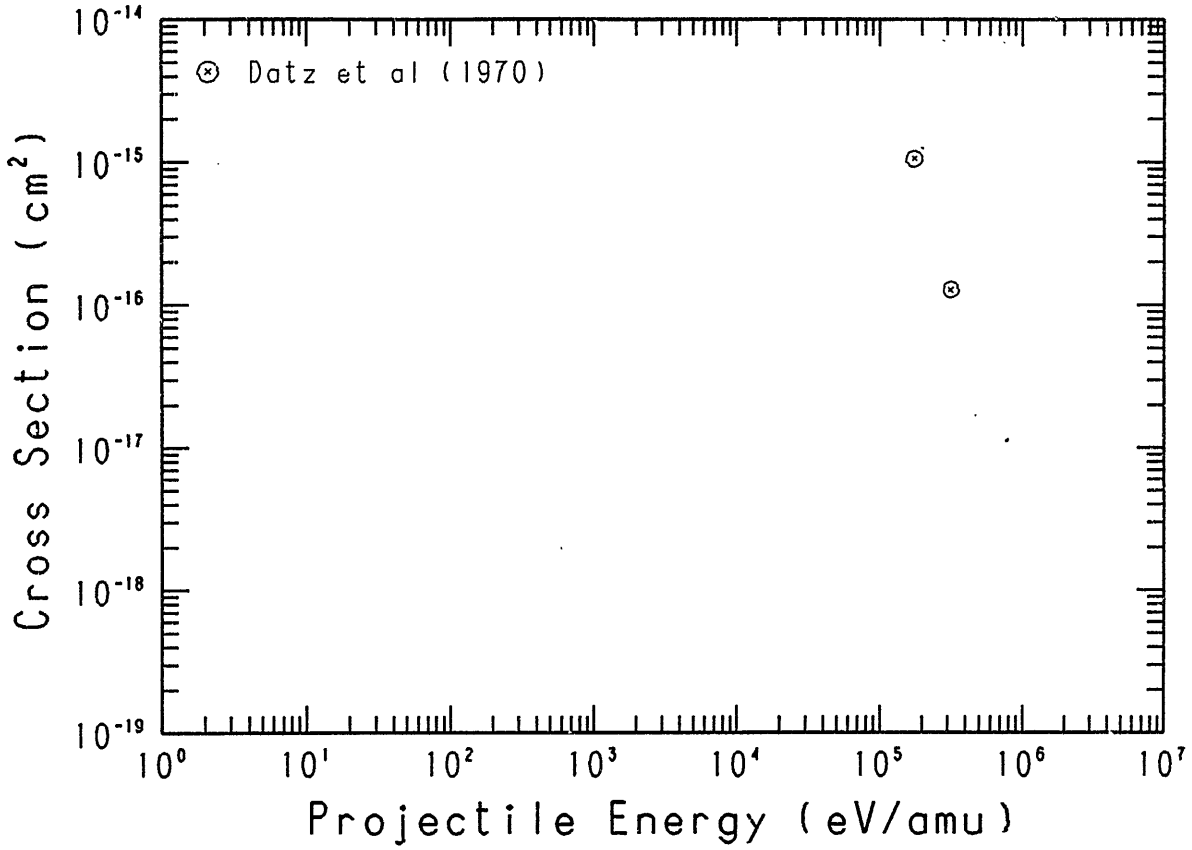


Fig. 96 $Br^{11+} + H_2 \rightarrow Br^{10+}$

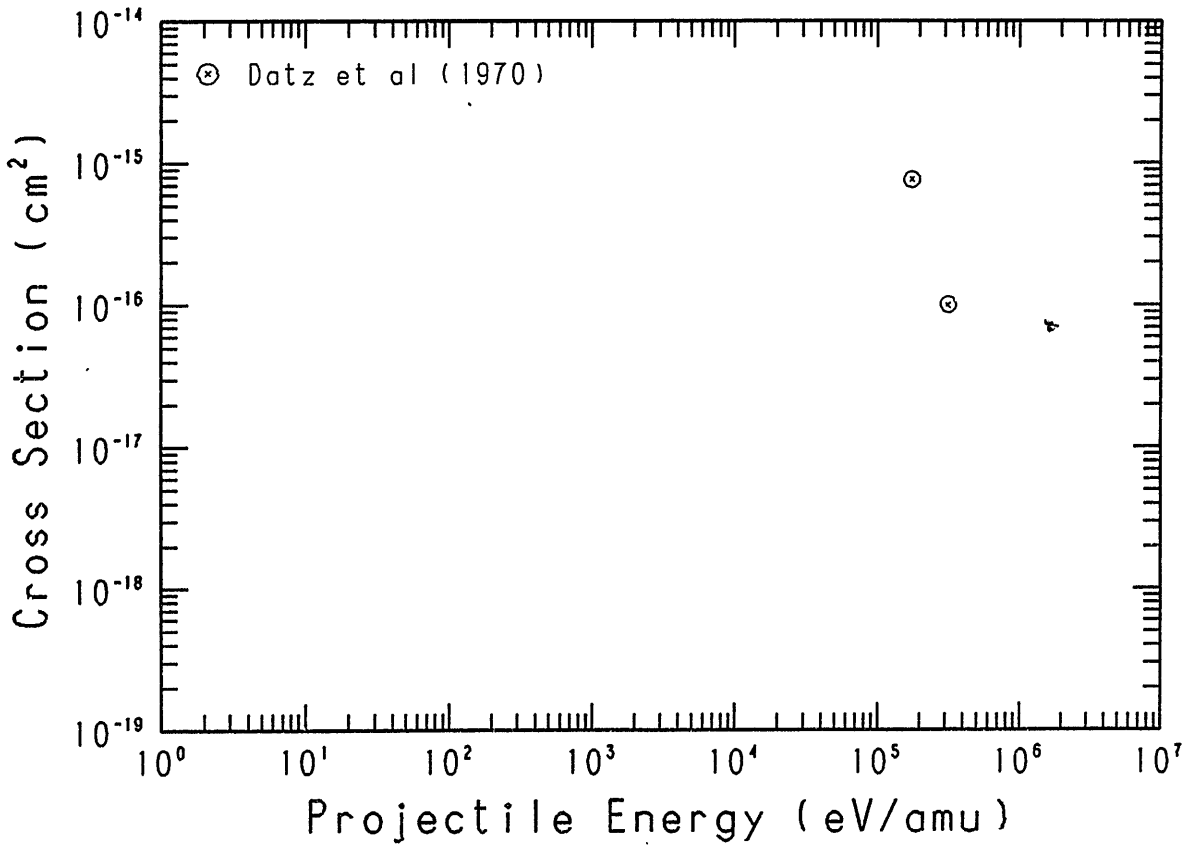


Fig. 97 $Br^{12+} + H_2 \rightarrow Br^{11+}$

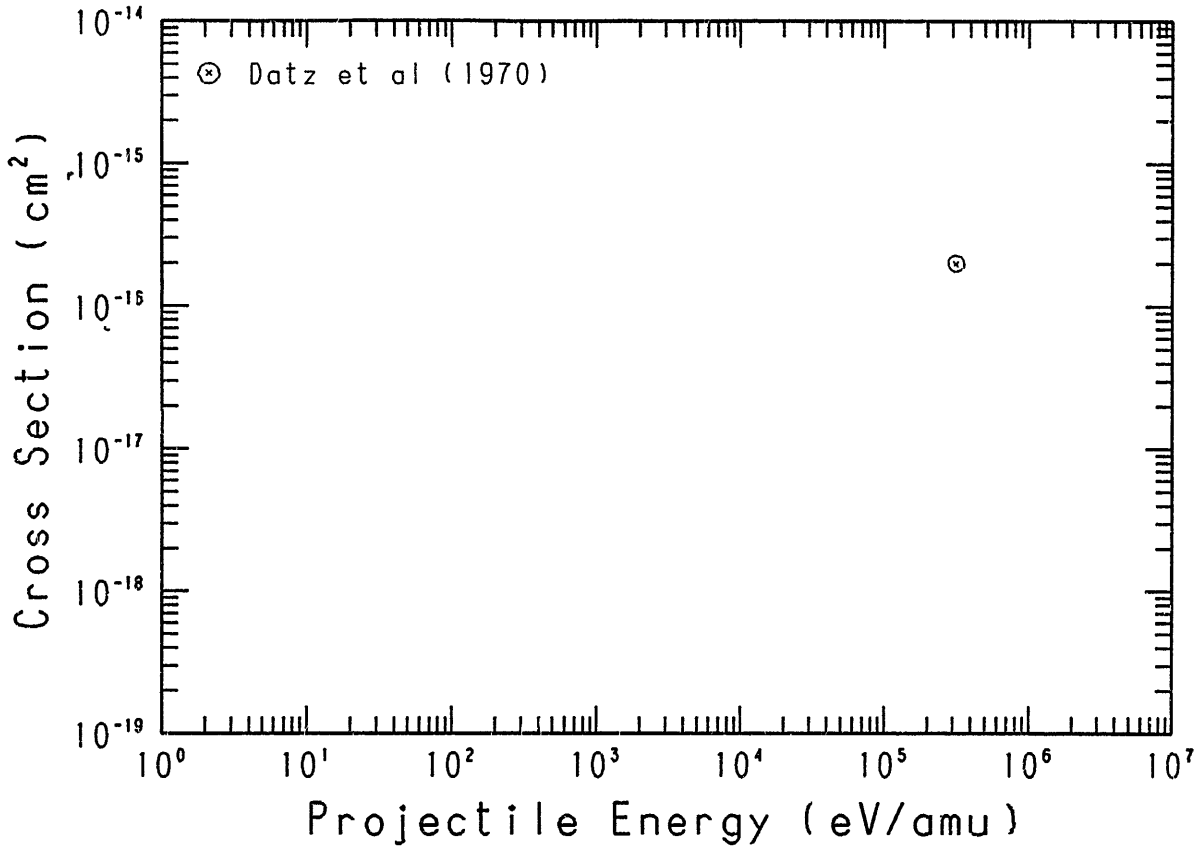


Fig. 98 $Kr^{2+} + H_2 \rightarrow Kr^{+}$

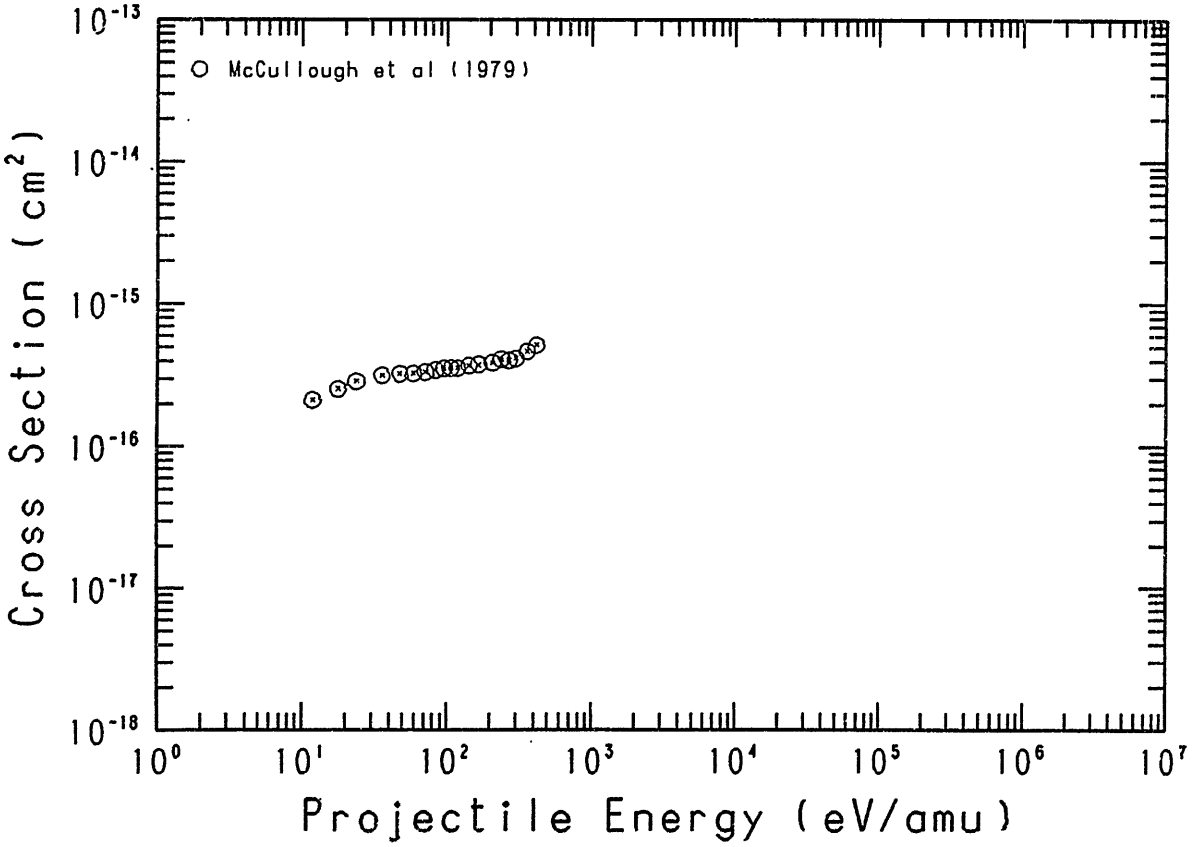


Fig. 99 $Mo^{4+} + H_2 \rightarrow Mo^{3+}$

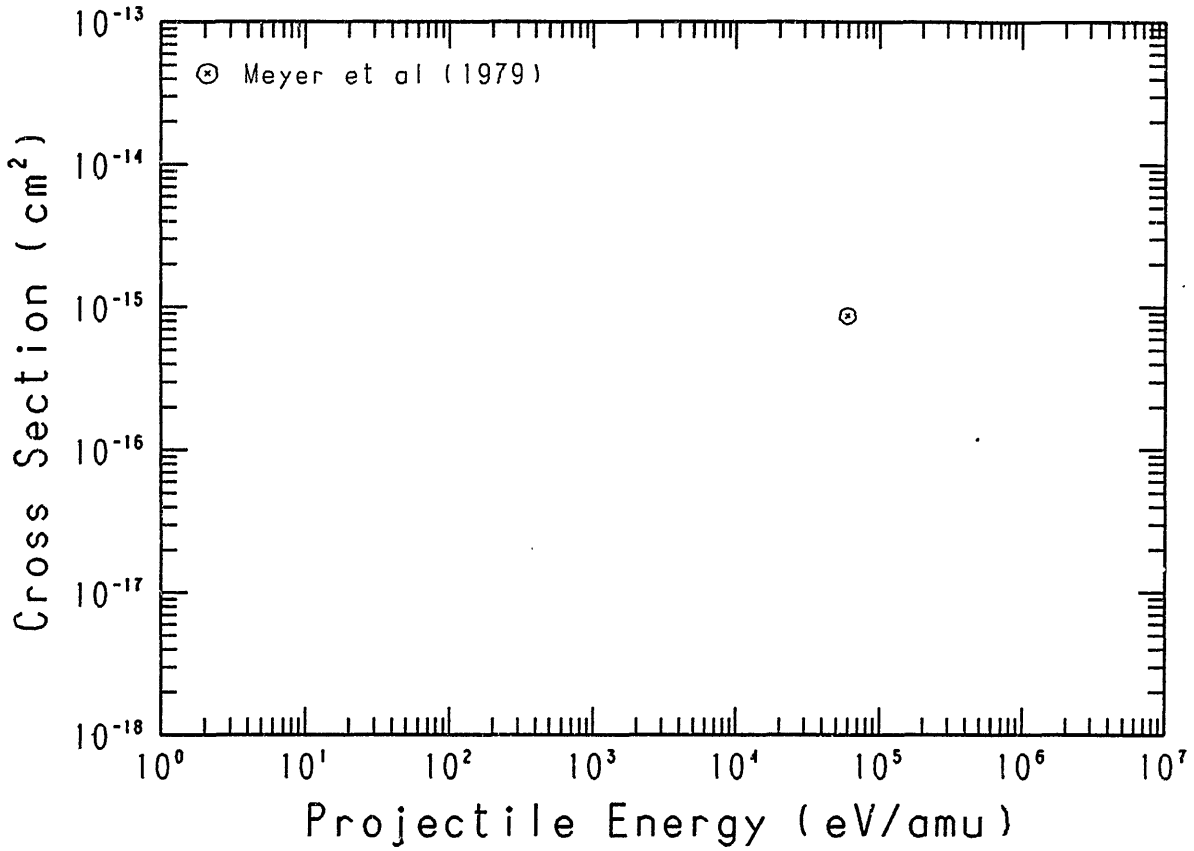


Fig. 100 $Mo^{5+} + H_2 \rightarrow Mo^{4+}$

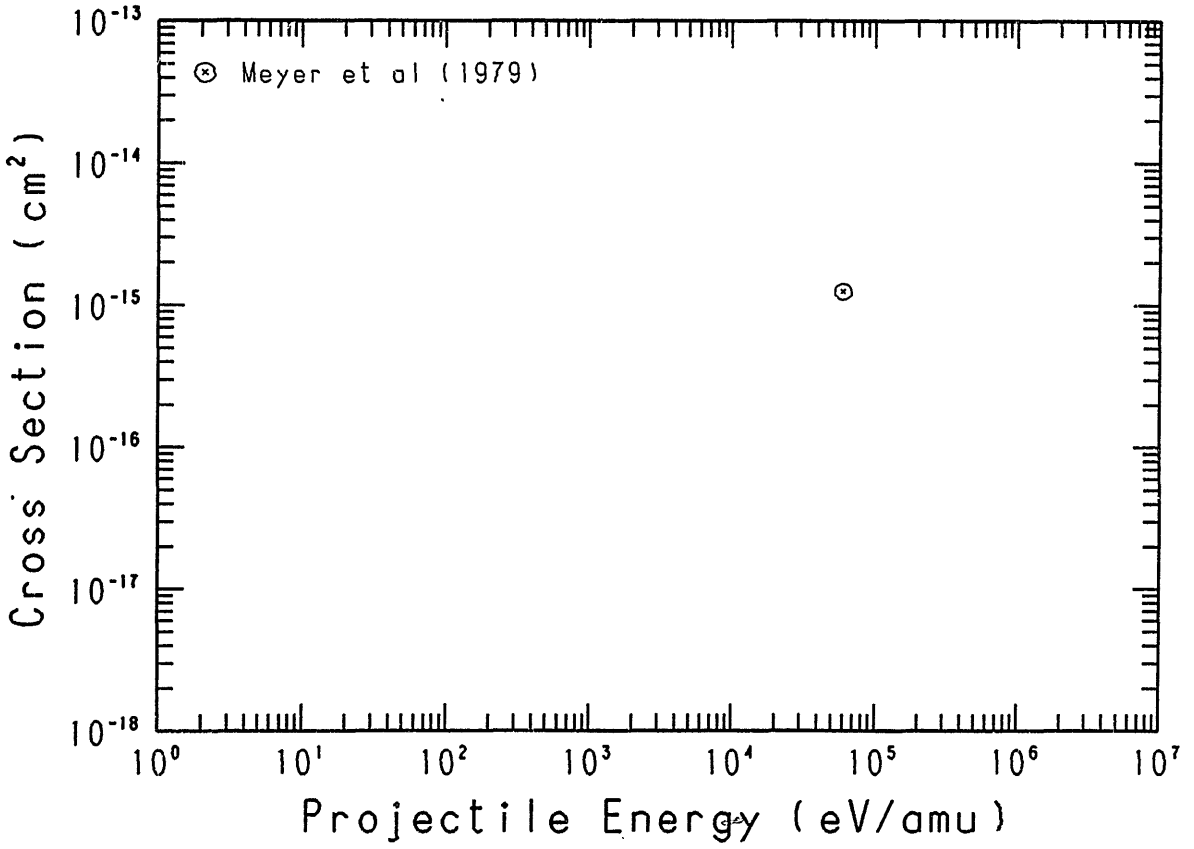


Fig. 101 $Mo^{7+} + H_2 \rightarrow Mo^{6+}$

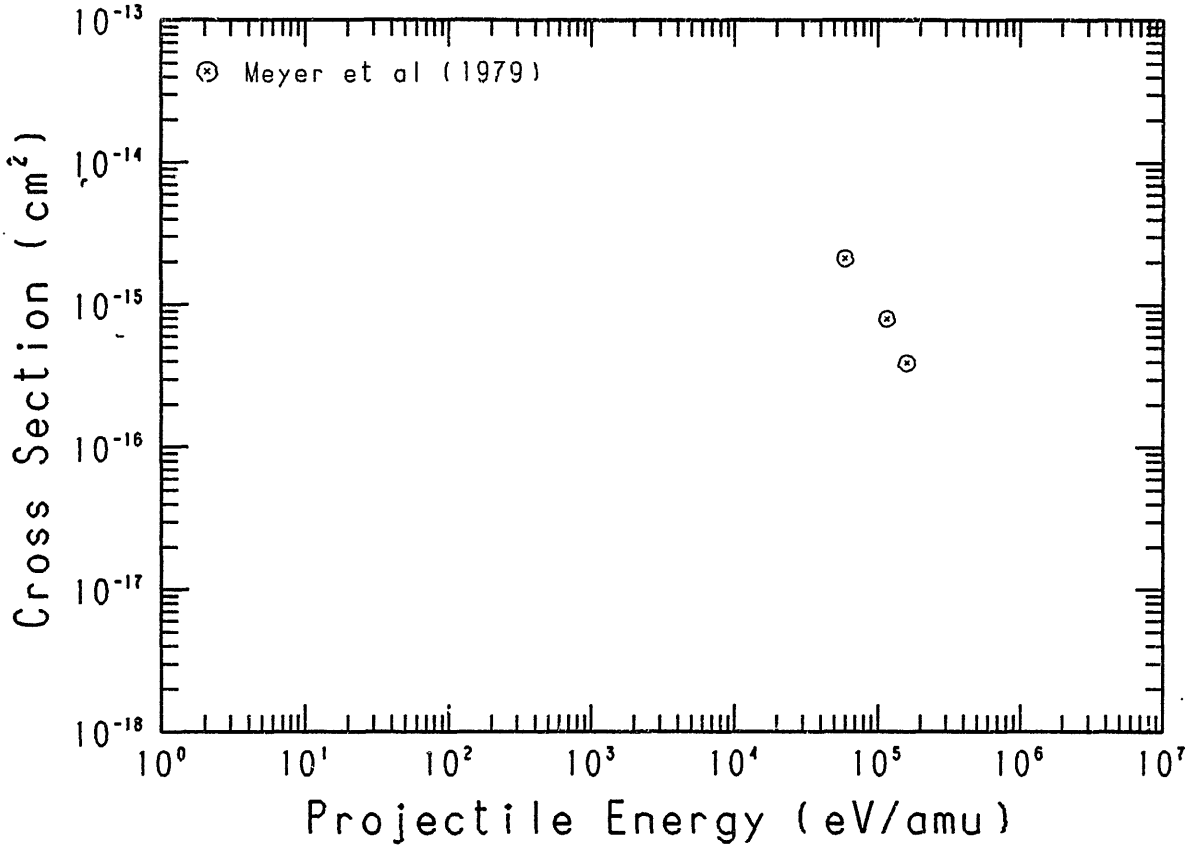


Fig. 102 $Mo^{6+} + H_2 \rightarrow Mo^{5+}$

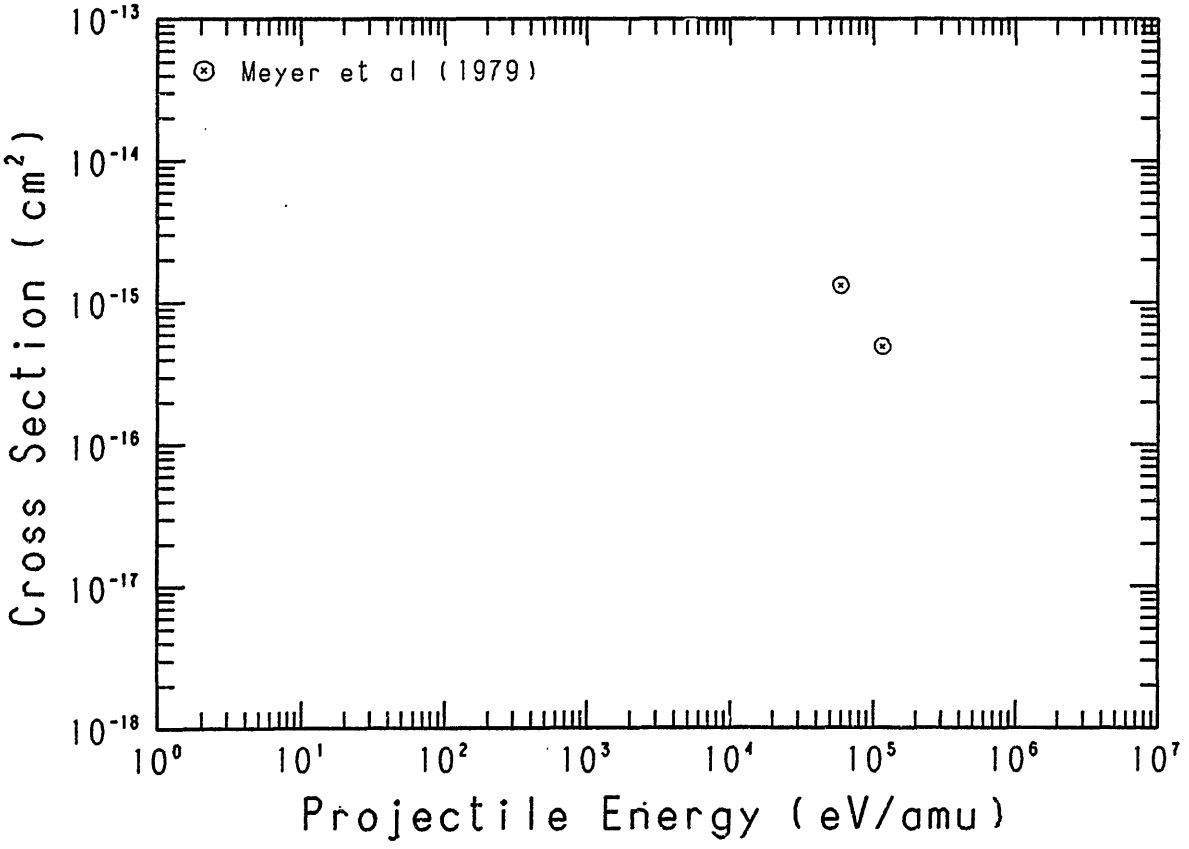


Fig. 103 $Mo^{8+} + H_2 \rightarrow Mo^{7+}$

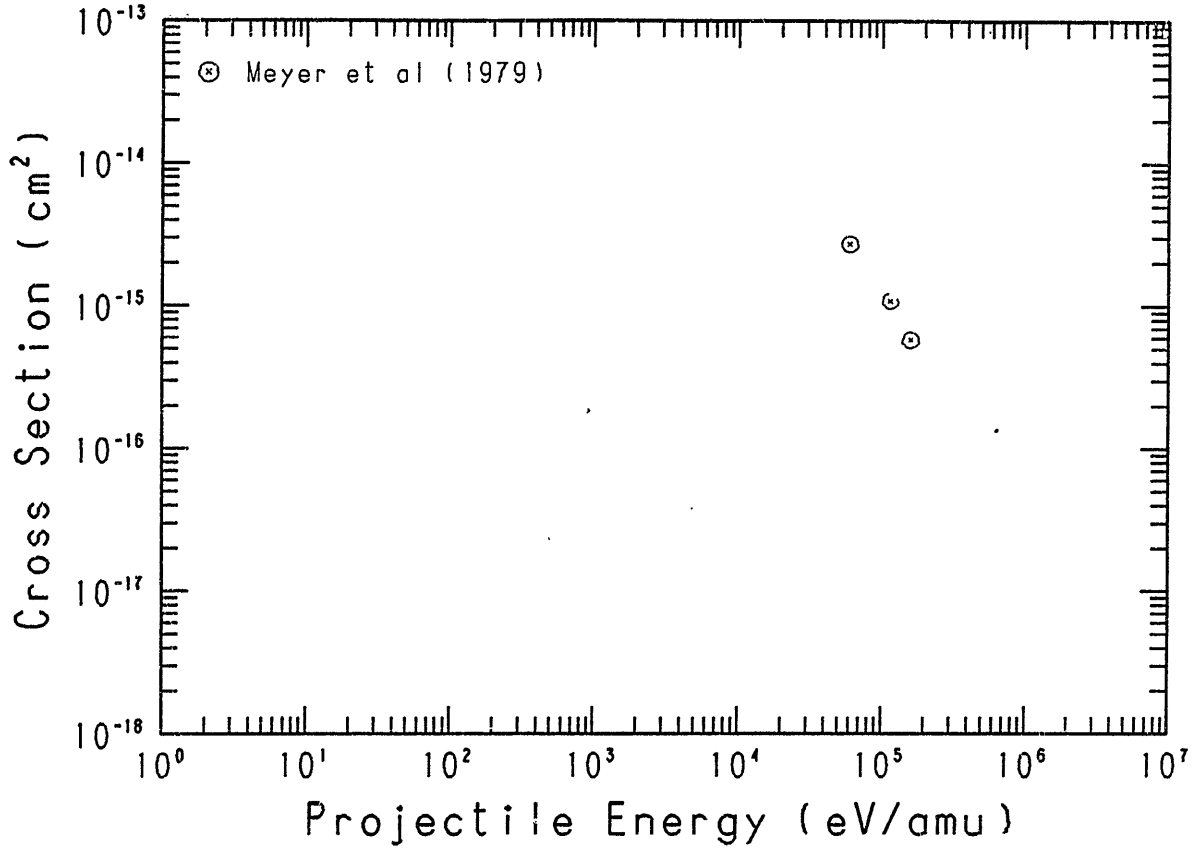


Fig. 104 $Mo^{9+} + H_2 \rightarrow Mo^{8+}$

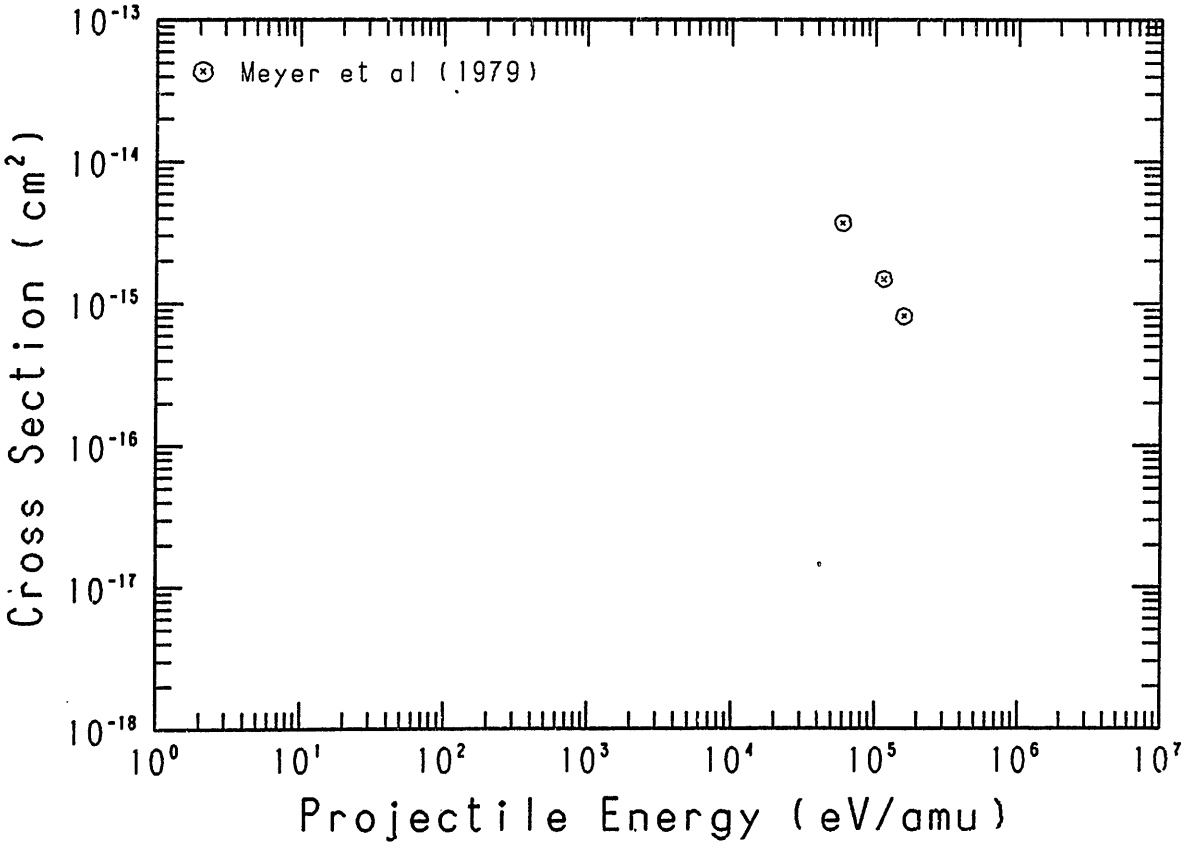


Fig. 105 $Mo^{10+} + H_2 \rightarrow Mo^{9+}$

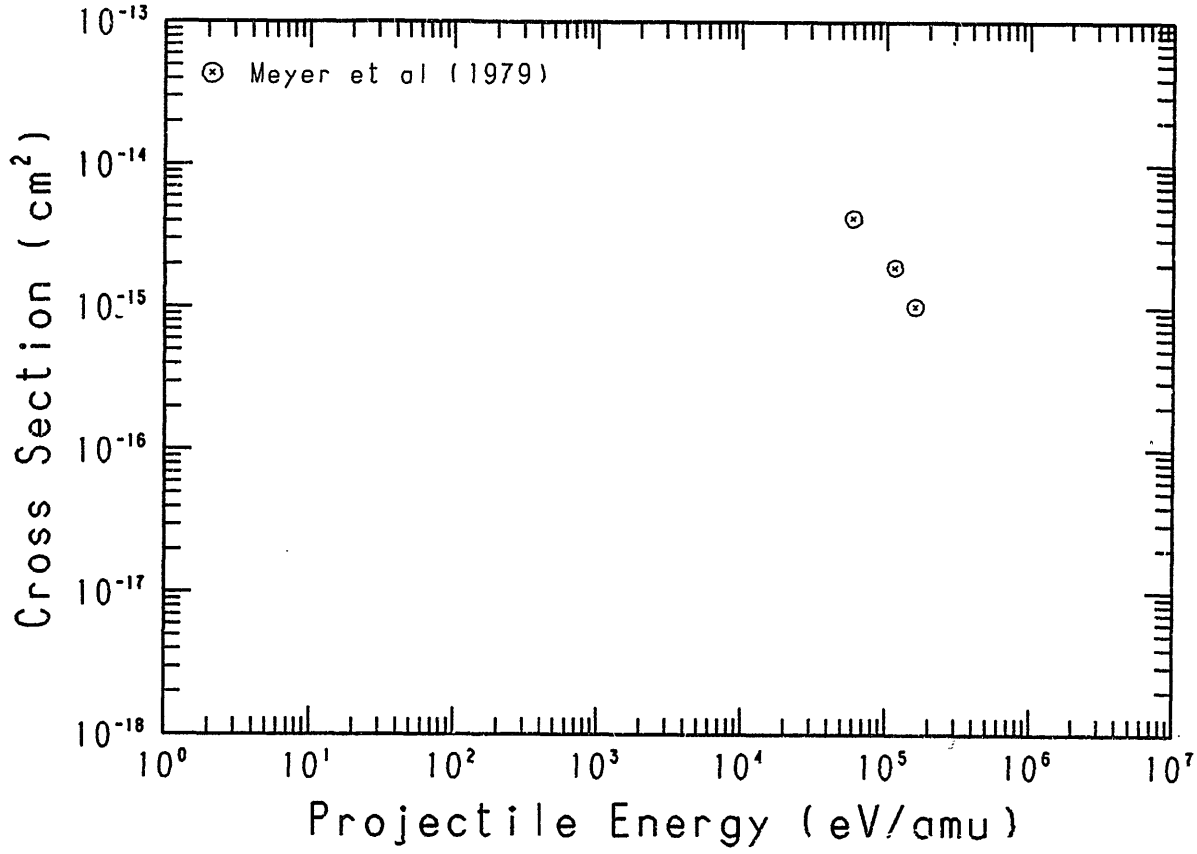


Fig. 106 $Mo^{11+} + H_2 \rightarrow Mo^{10+}$

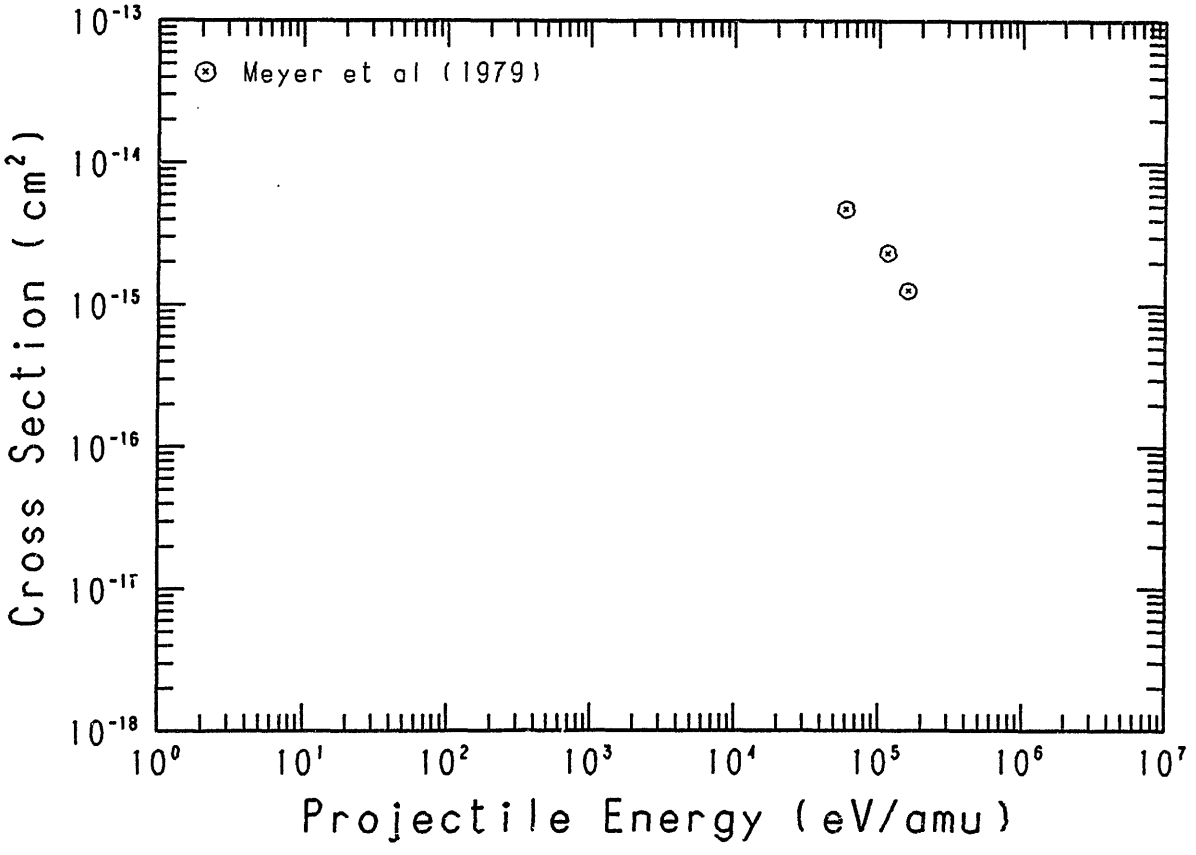


Fig. 107 $Mo^{12+} + H_2 \rightarrow Mo^{11+}$

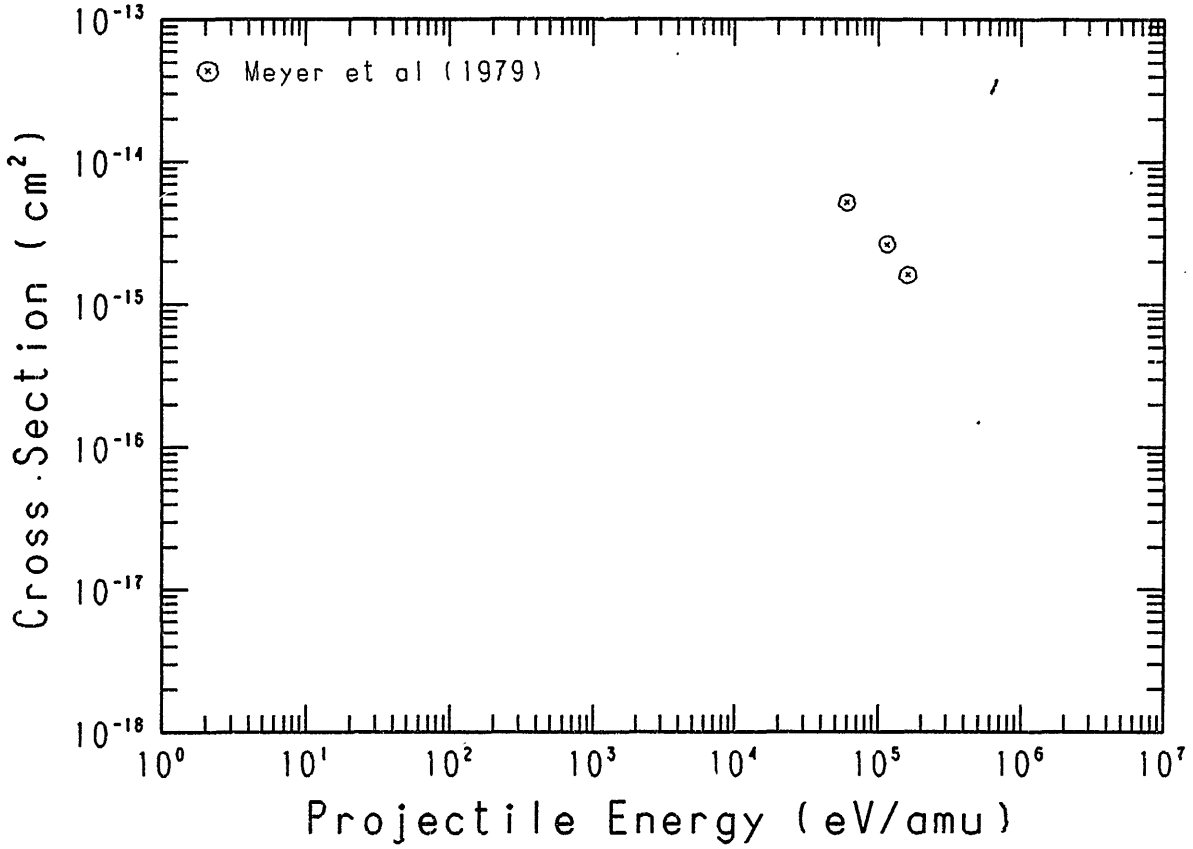


Fig. 108 $Mo^{13+} + H_2 \rightarrow Mo^{12+}$

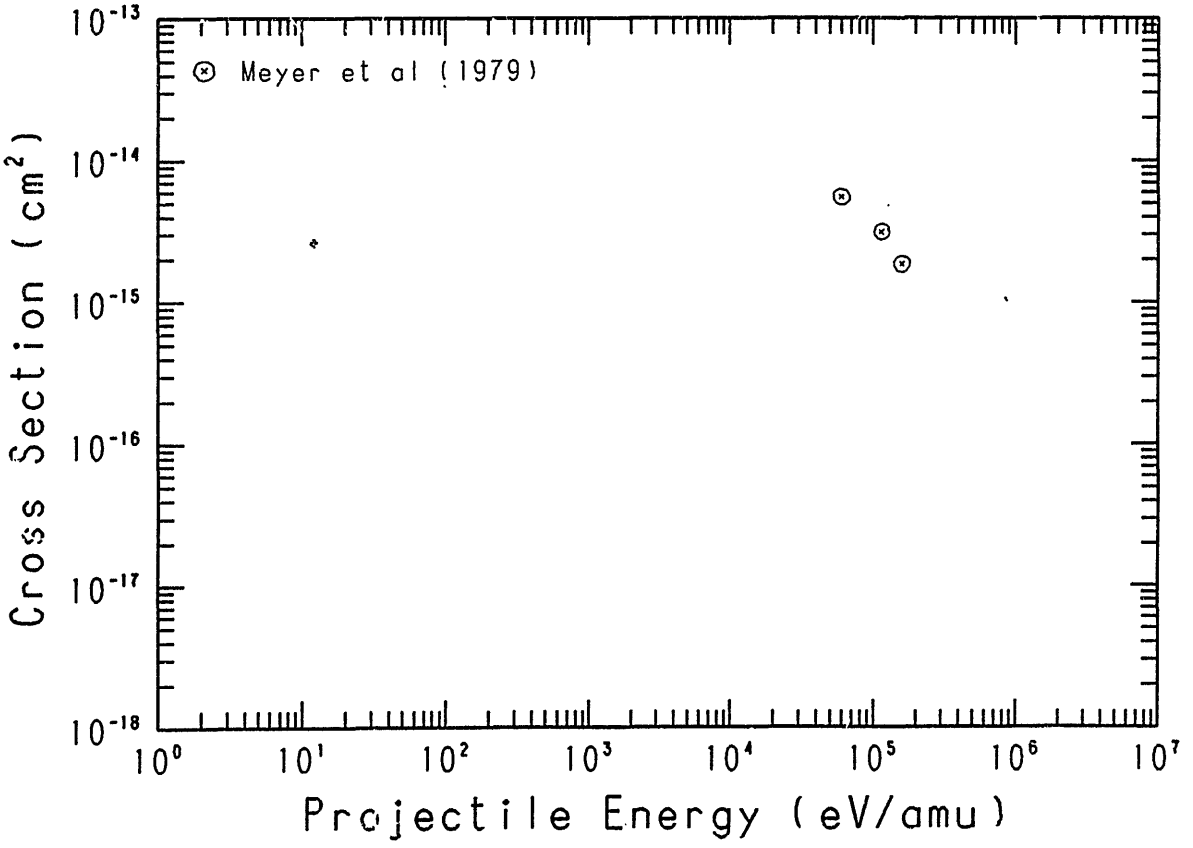


Fig. 109 $Mo^{14+} + H_2 \rightarrow Mo^{13+}$

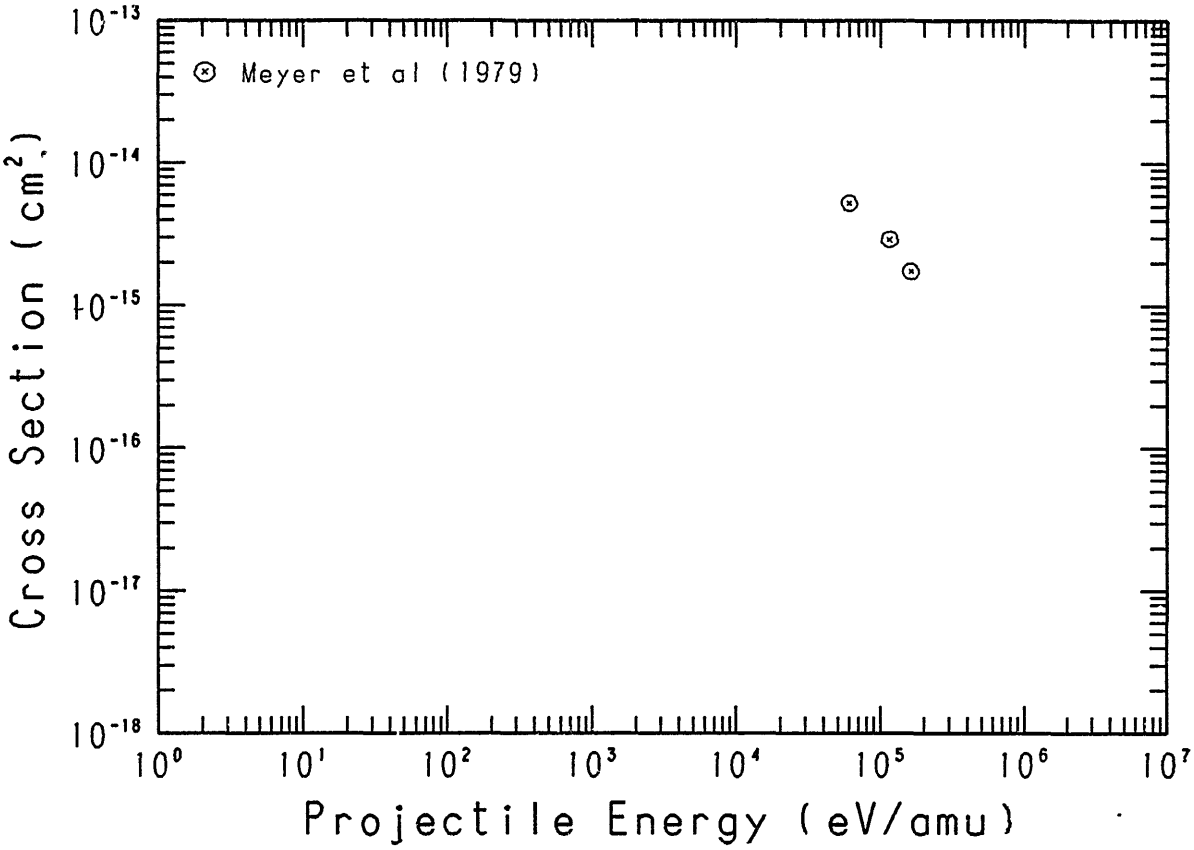


Fig. 110 $Mo^{15+} + H_2 \rightarrow Mo^{14+}$

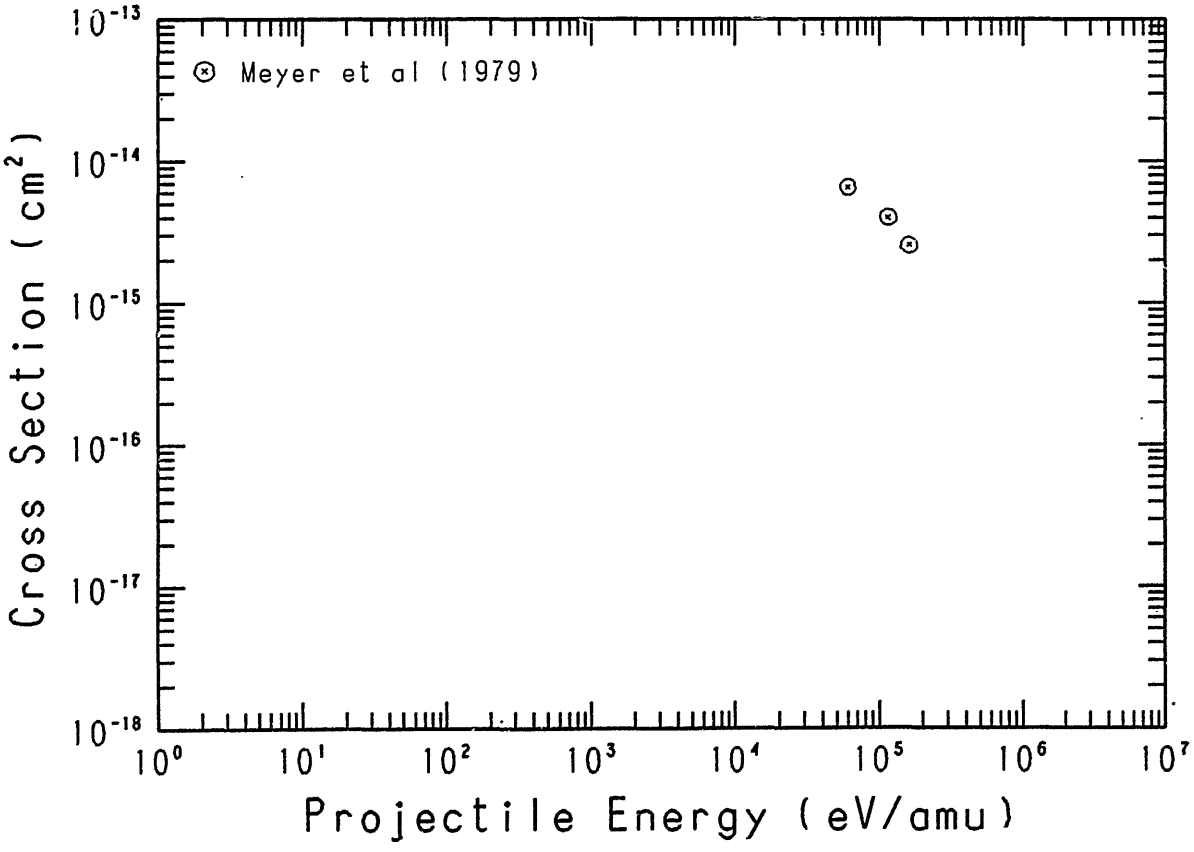


Fig. 111 $Mo^{16+} + H_2 \rightarrow Mo^{15+}$

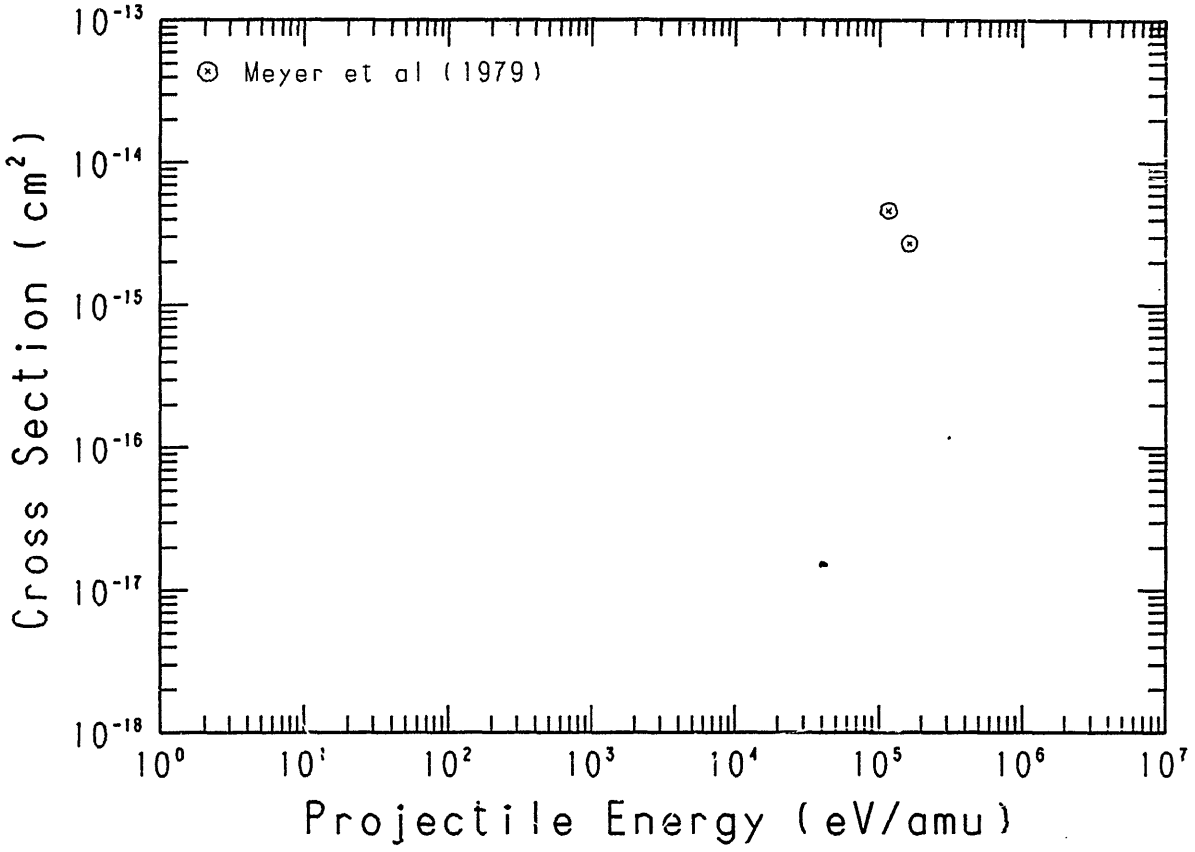


Fig. 112 $Mo^{17+} + H_2 \rightarrow Mo^{16+}$

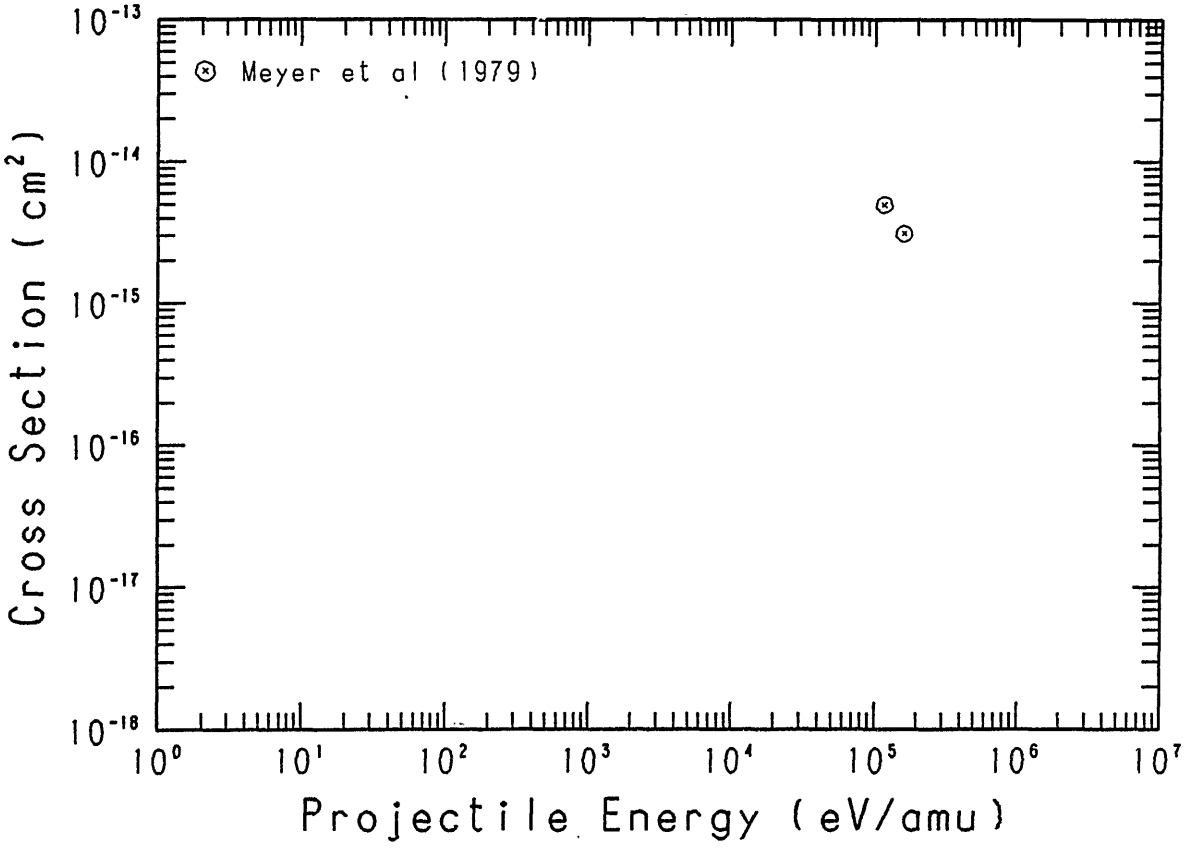


Fig. 113 $Mo^{18+} + H_2 \rightarrow Mo^{17+}$

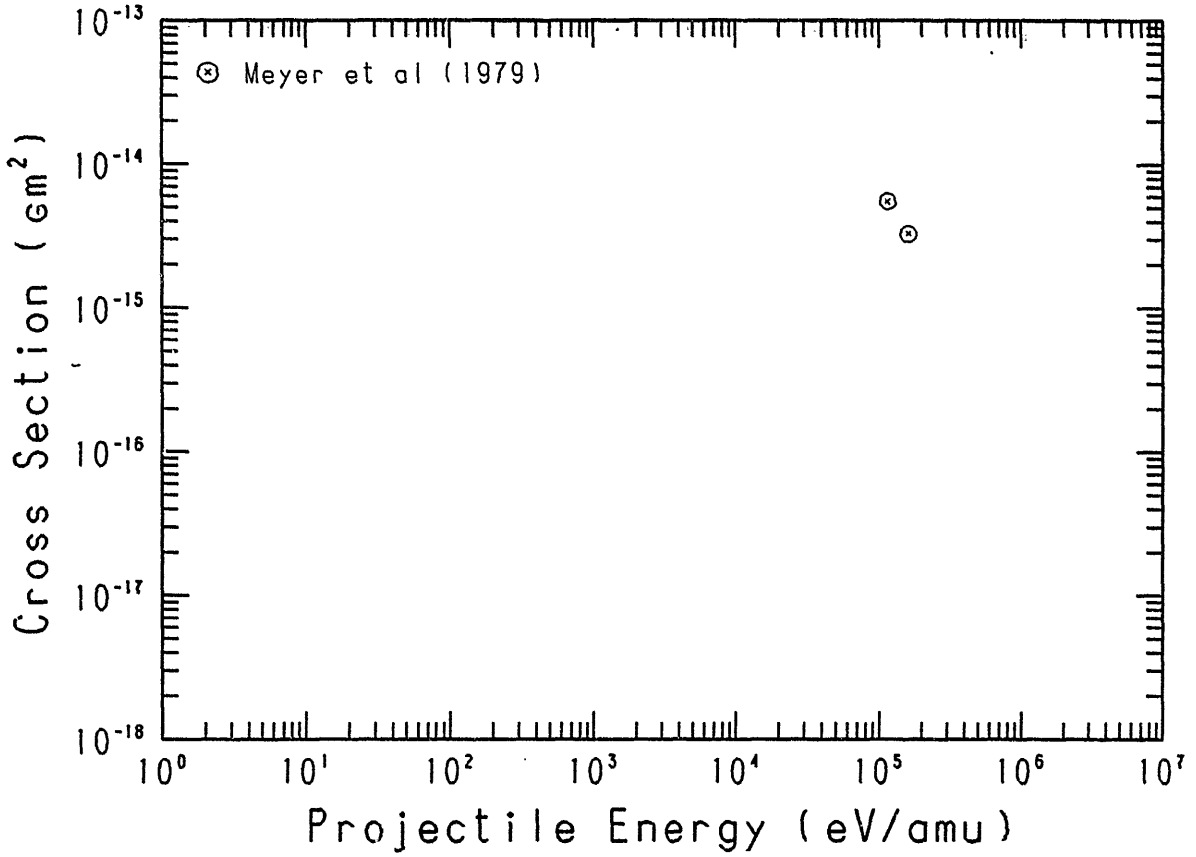


Fig. 114 $Cd^{2+} + H_2 \rightarrow Cd^{+}$

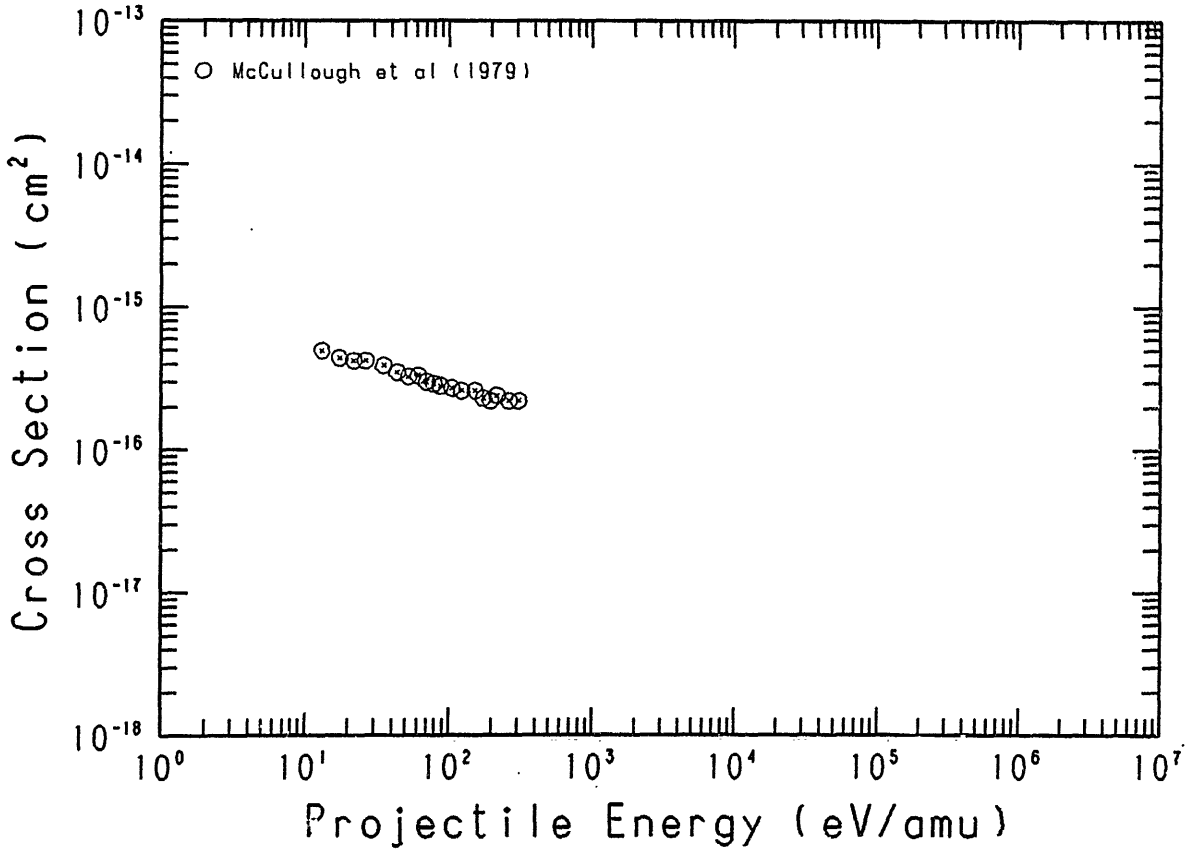


Fig. 115 $I^{2+} + H_2 \rightarrow I$

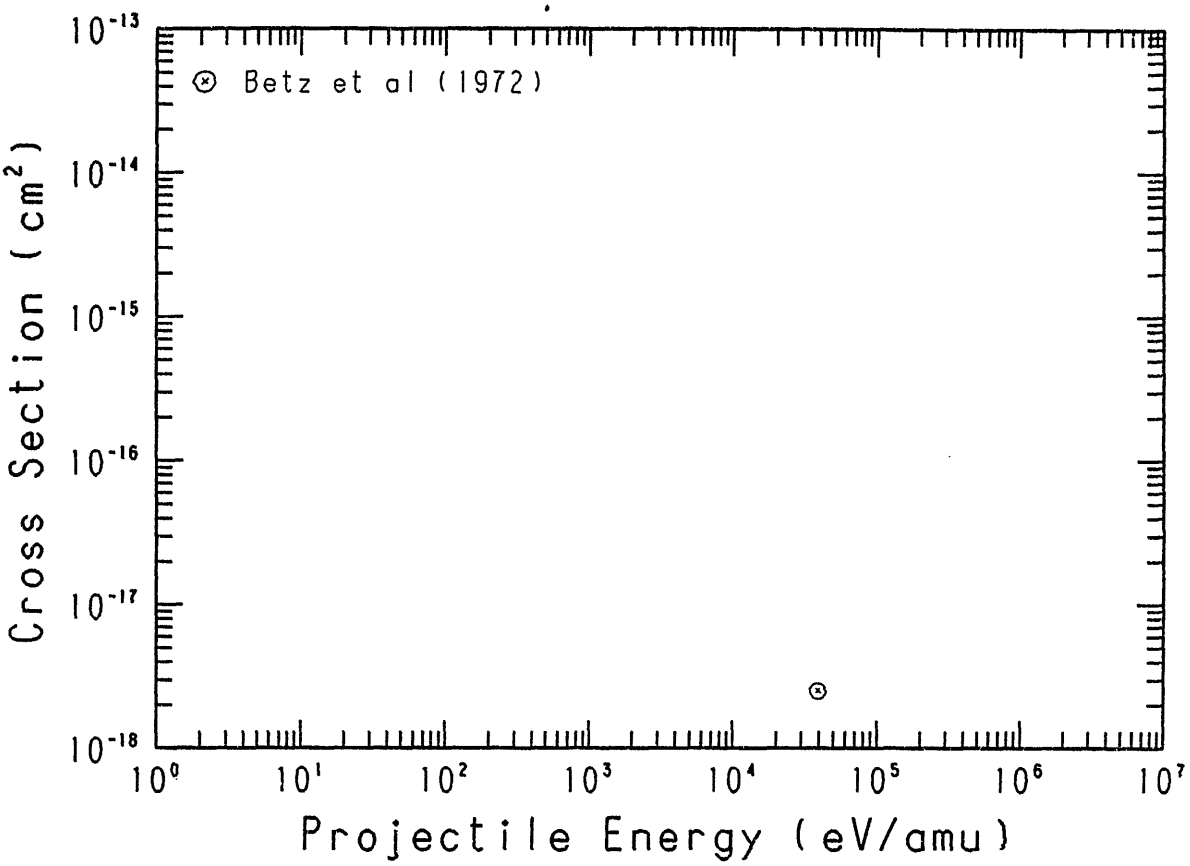


Fig. 116 $I^{2+} + H_2 \rightarrow I^{+}$

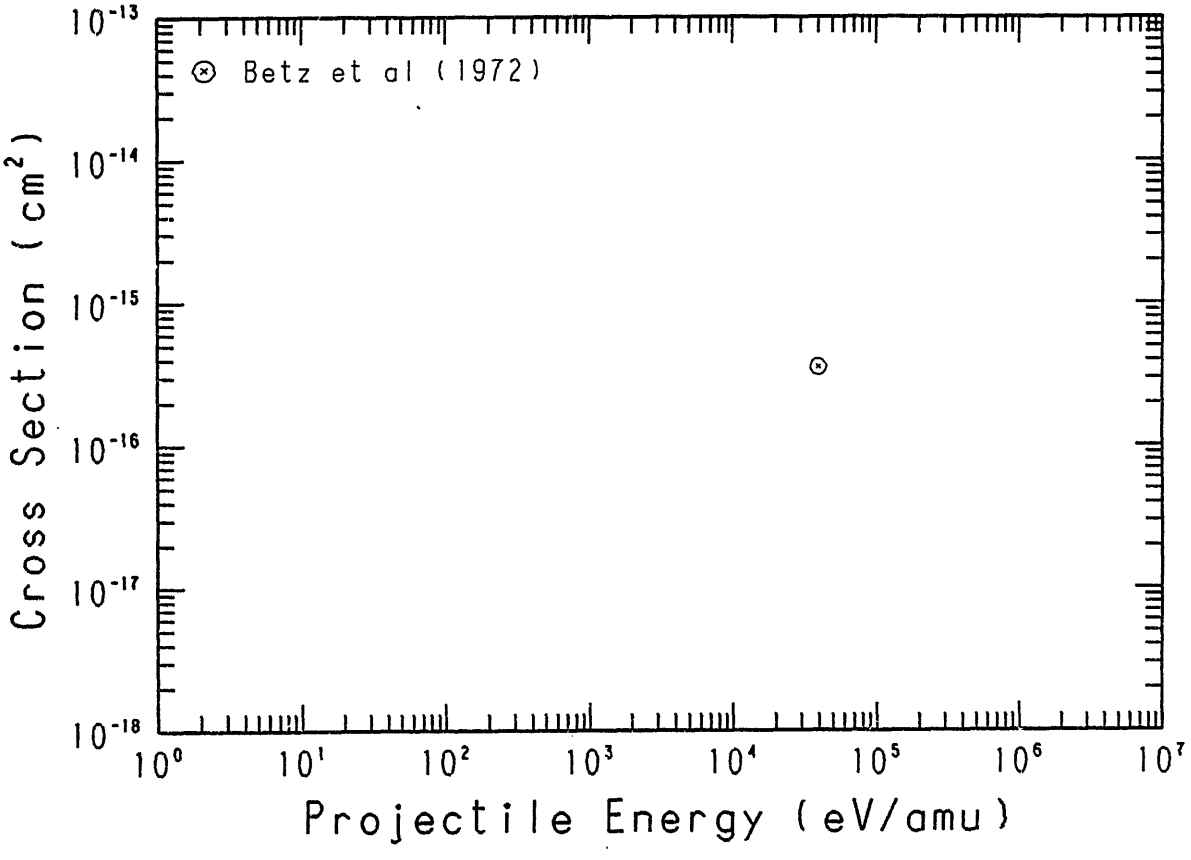


Fig. 117 $I^{3+} + H_2 \rightarrow I^{+}$

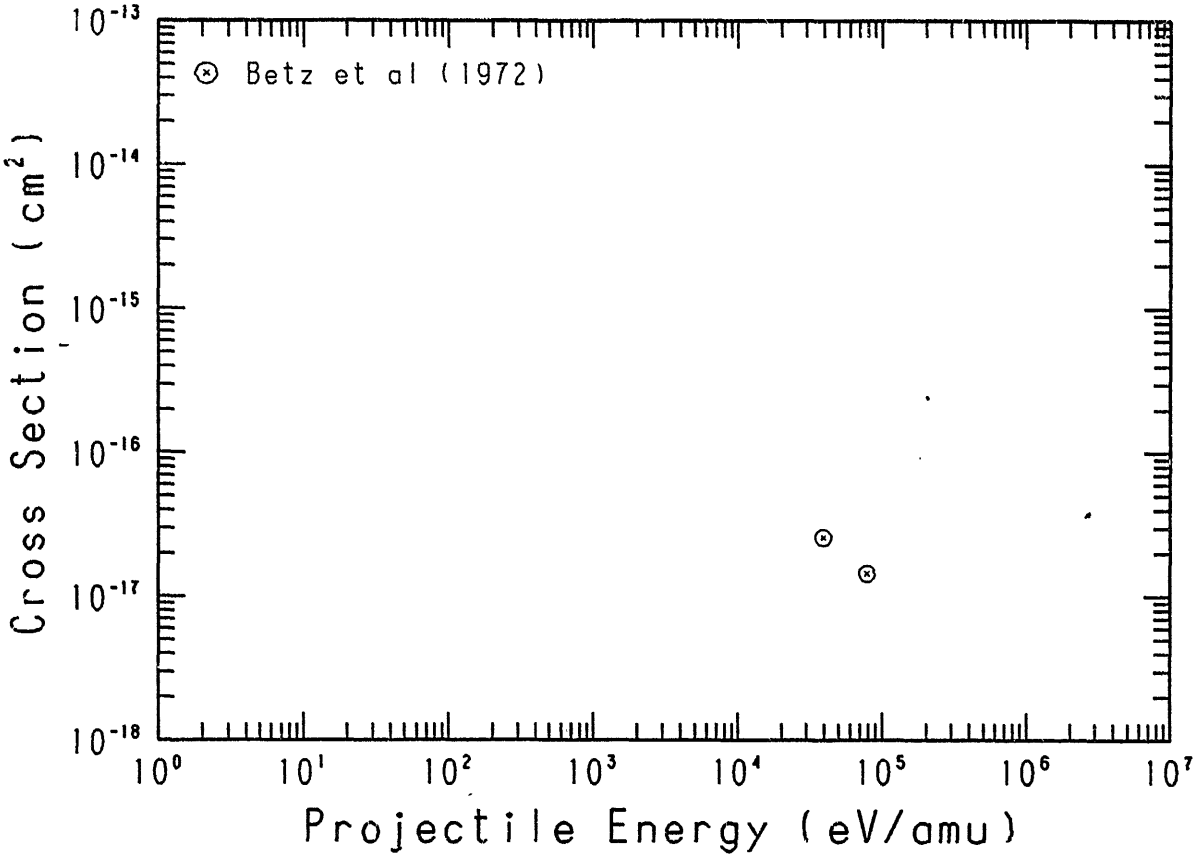


Fig. 118 $I^{3+} + H_2 \rightarrow I^{2+}$

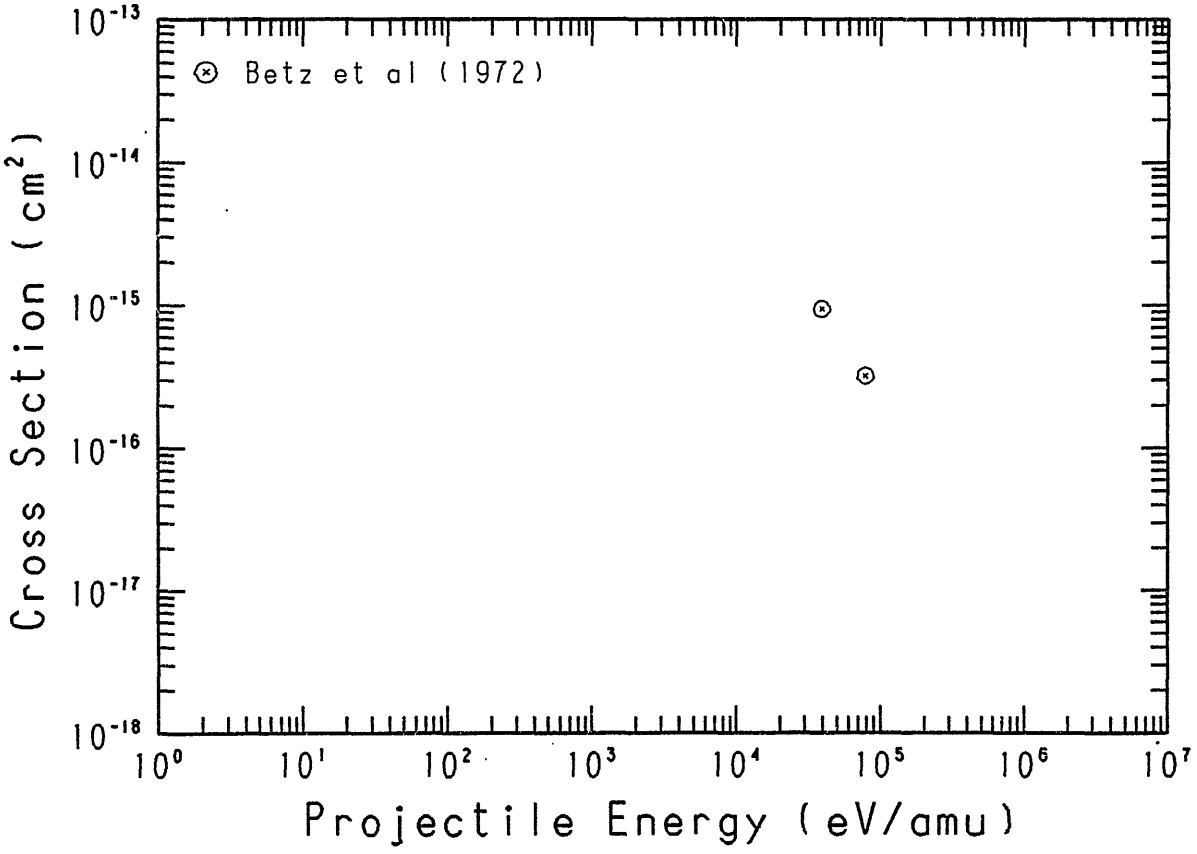


Fig. 119 $I^{4+} + H_2 \rightarrow I^{2+}$

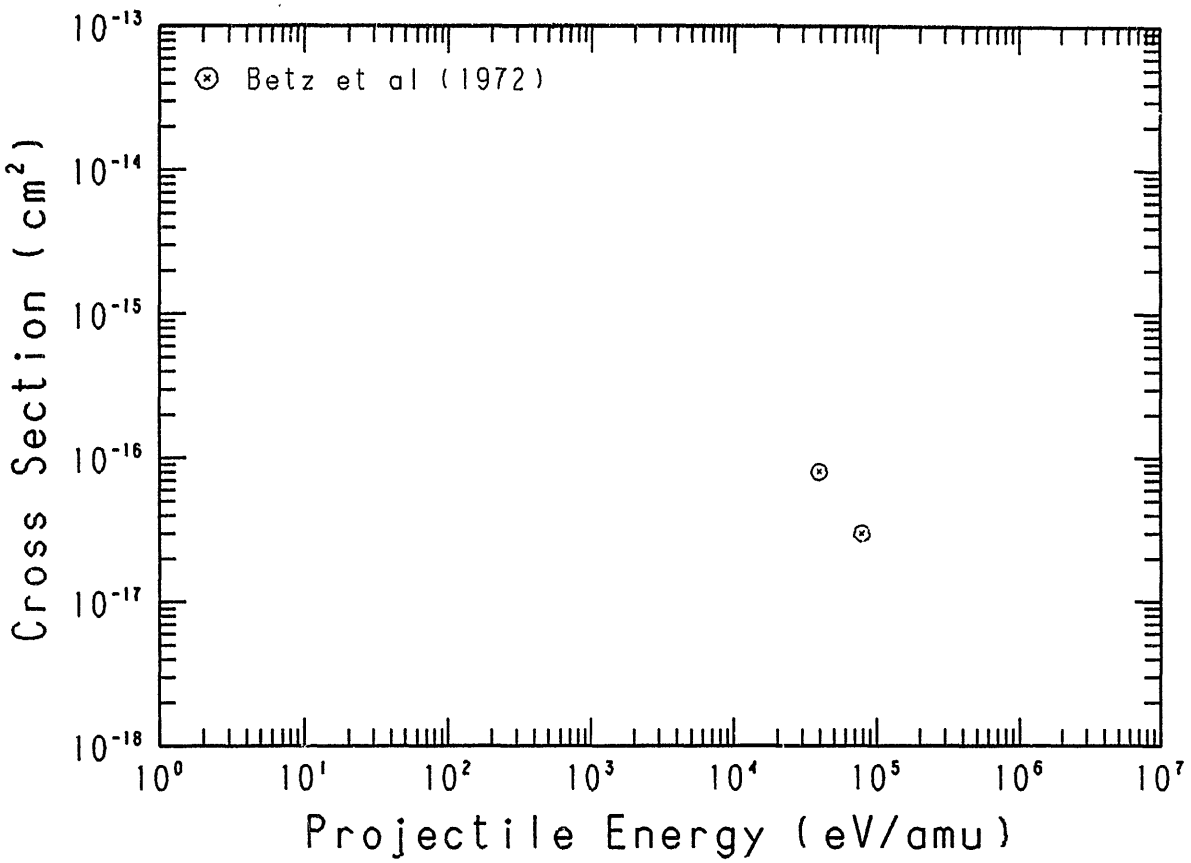


Fig. 120 $I^{4+} + H_2 \rightarrow I^{3+}$

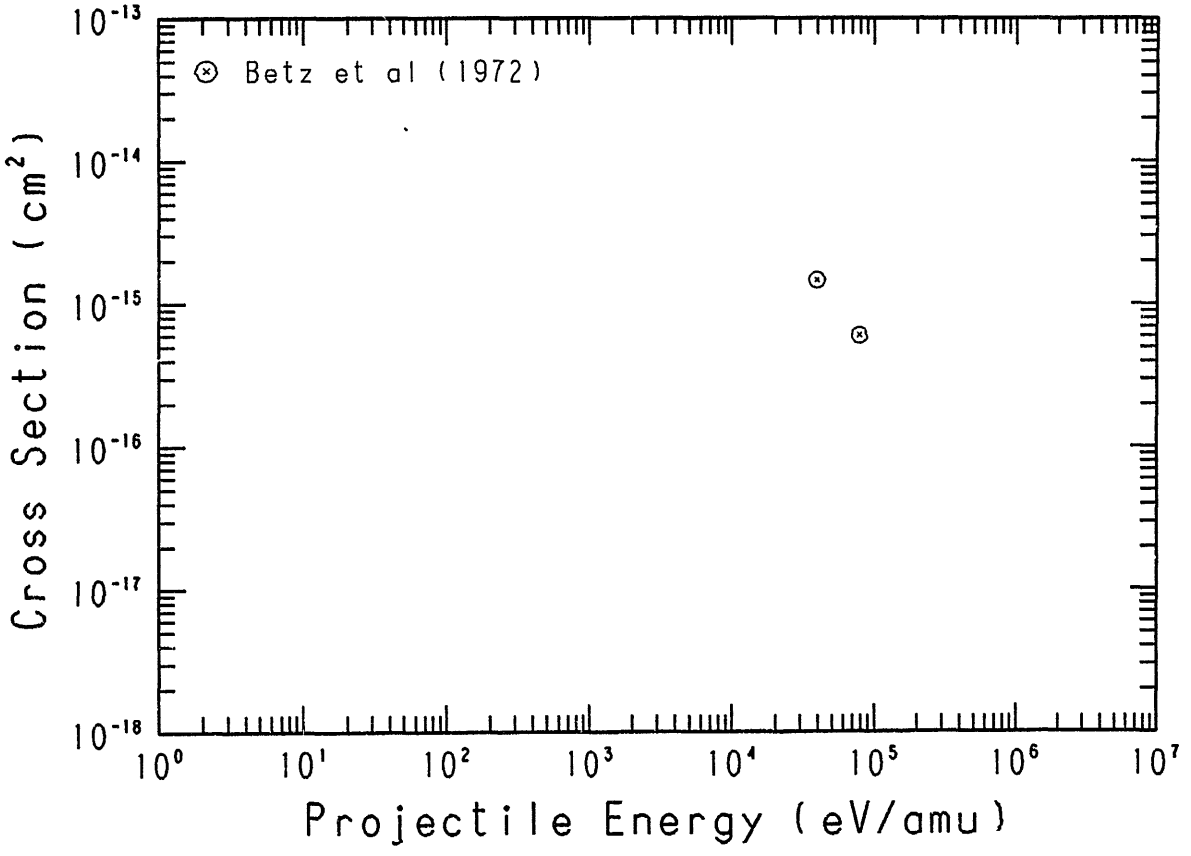


Fig. 121 $I^{5+} + H_2 \rightarrow I^{3+}$

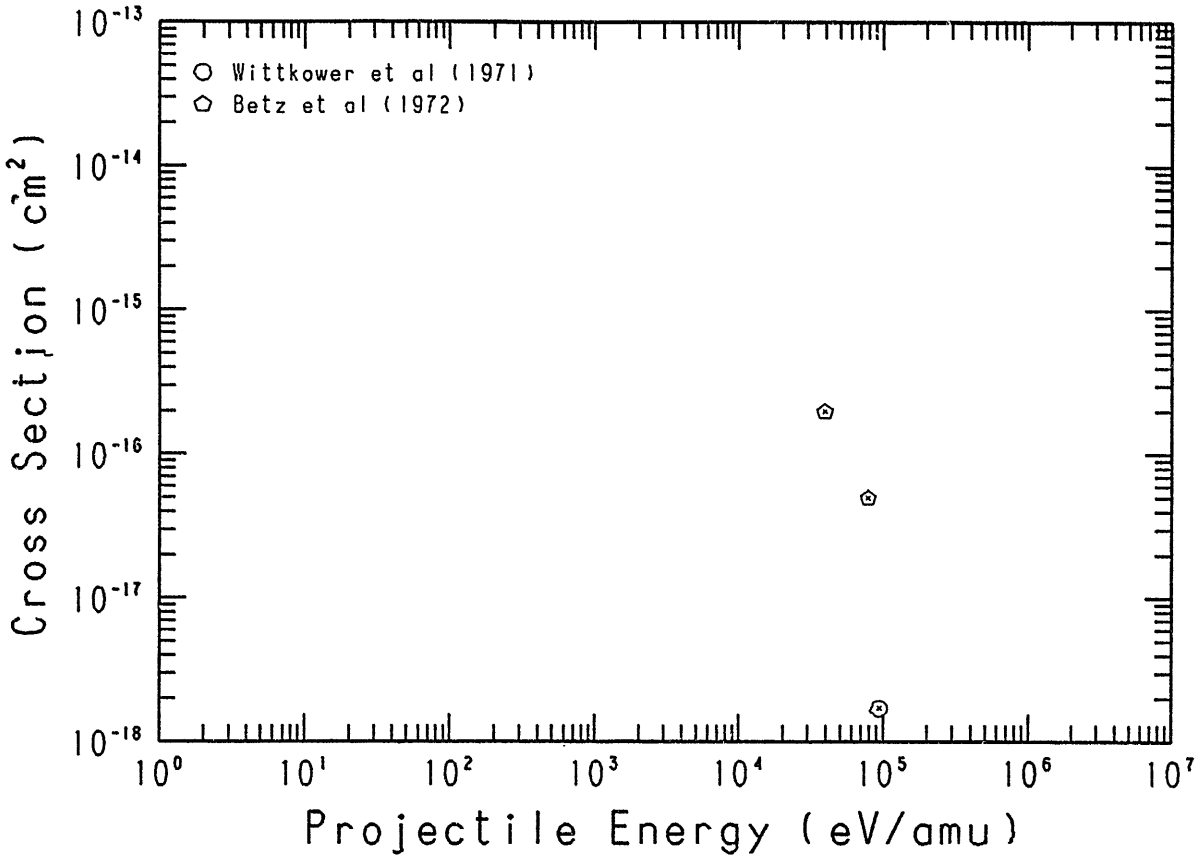


Fig. 122 $I^{5+} + H_2 \rightarrow I^{4+}$

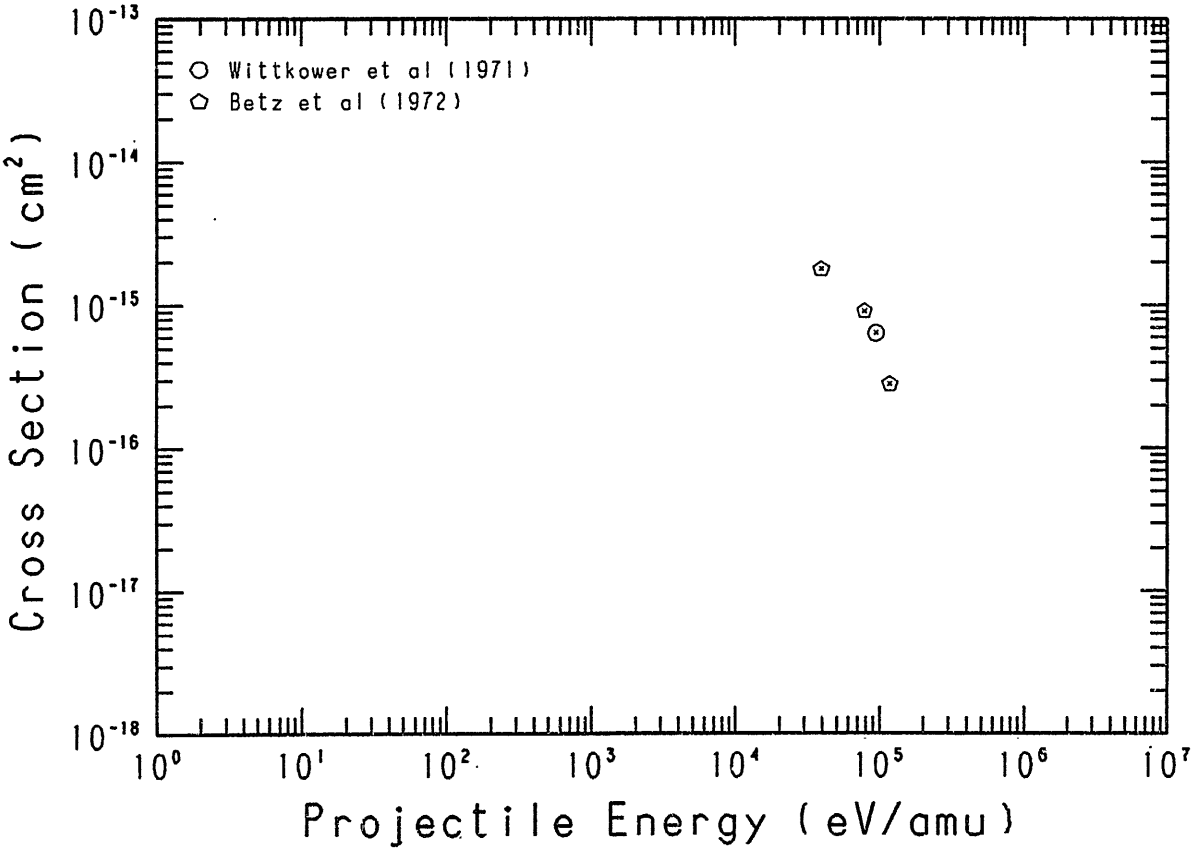


Fig. 123 $I^{6+} + H_2 \rightarrow I^{4+}$

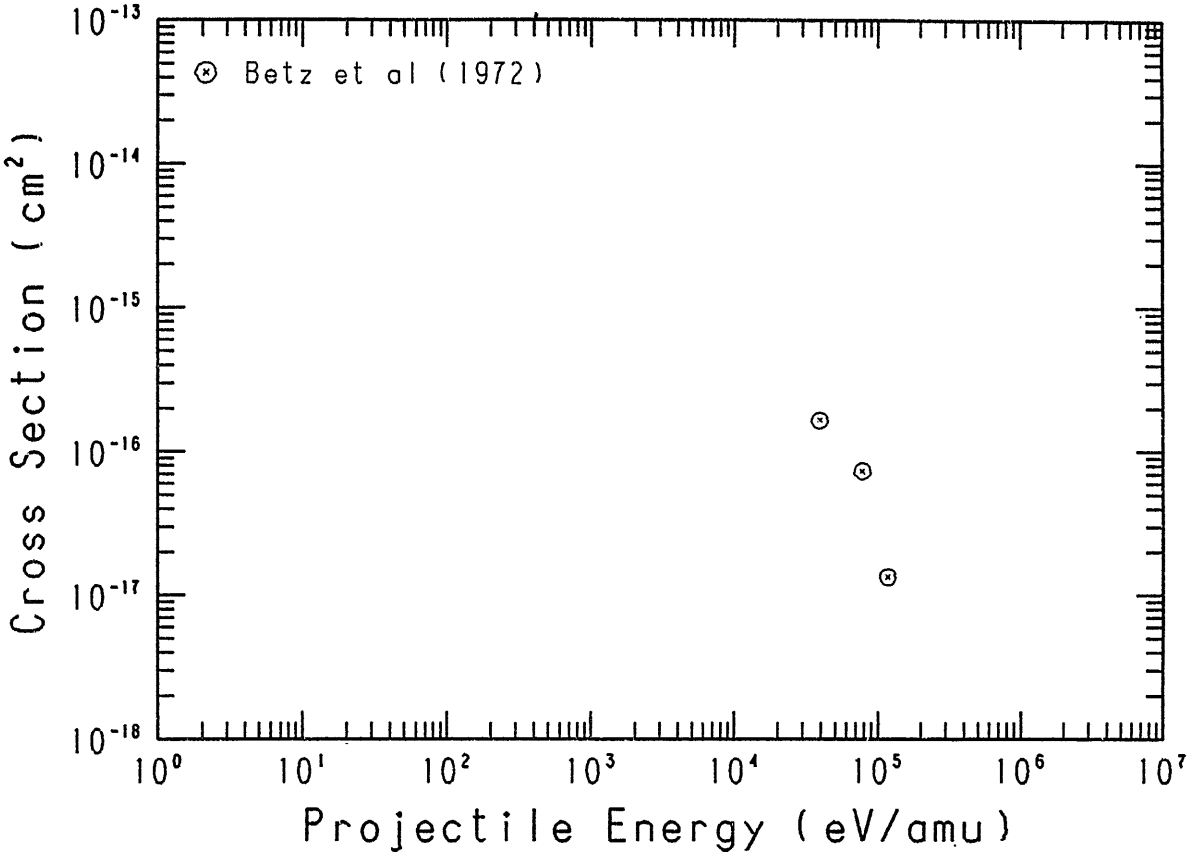


Fig. 124 $I^{6+} + H_2 \rightarrow I^{5+}$

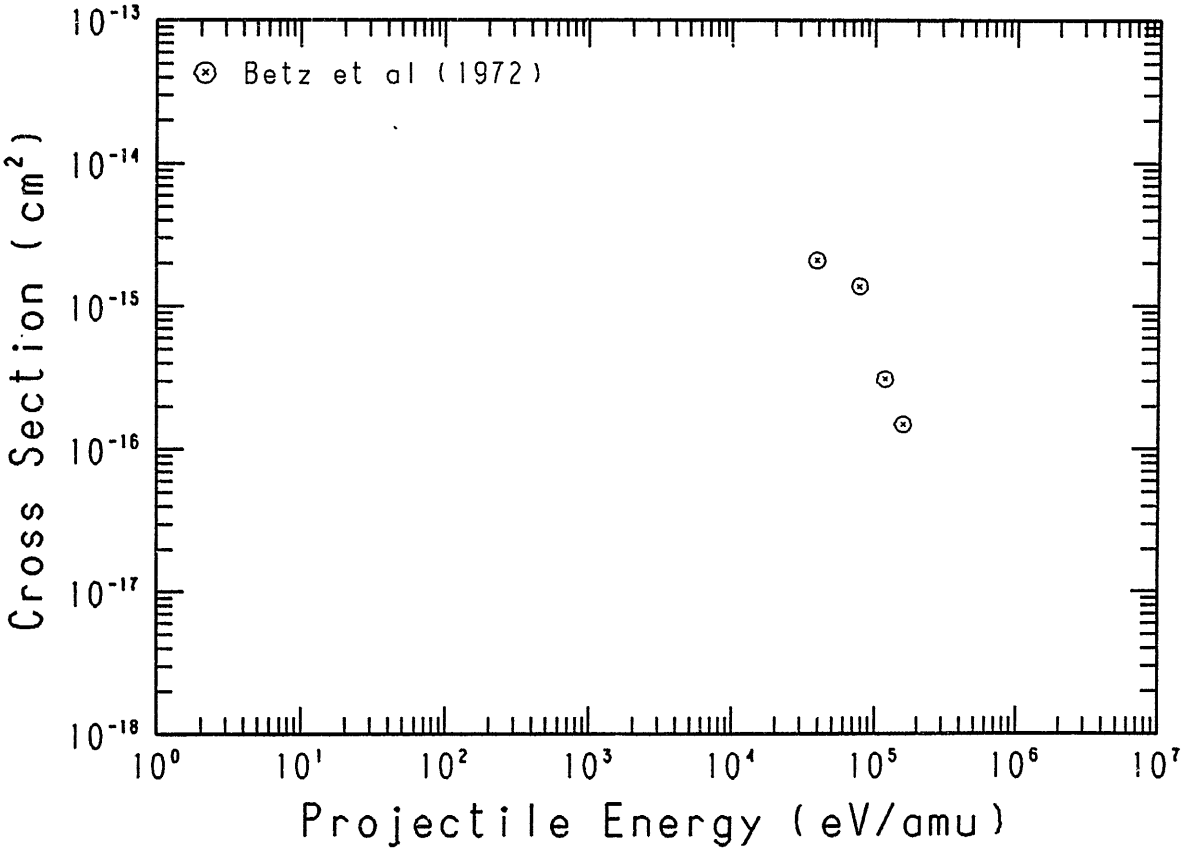


Fig. 125 $I^{7+} + H_2 \rightarrow I^{5+}$

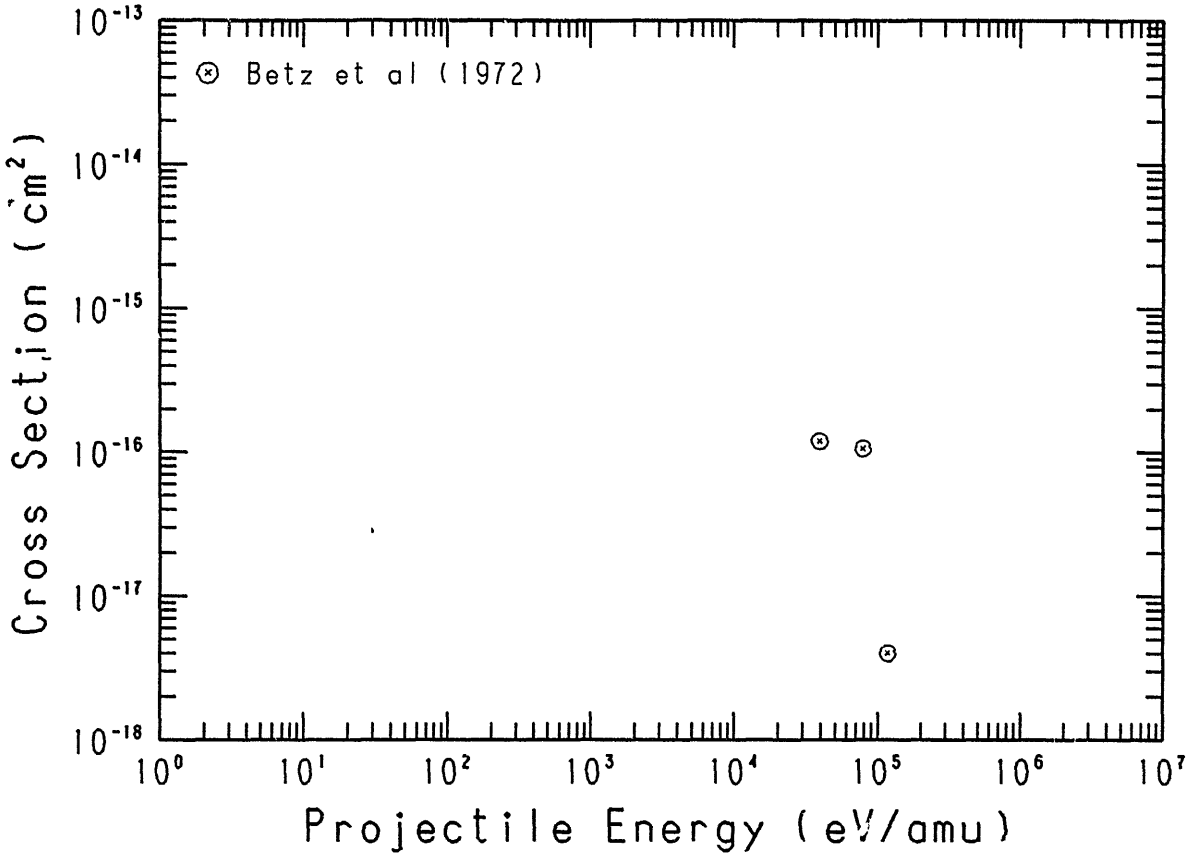


Fig. 126 $I^{7+} + H_2 \rightarrow I^{6+}$

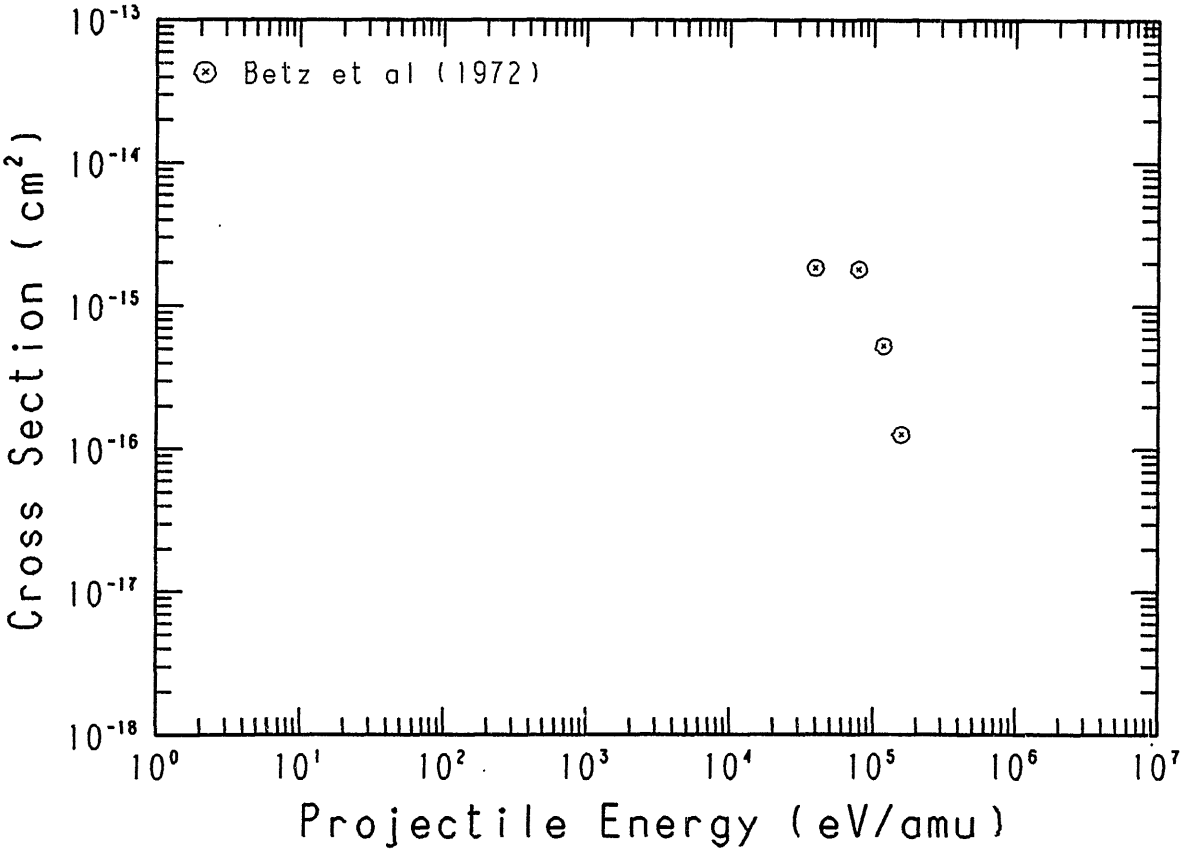


Fig. 127 $I^{8+} + H_2 \rightarrow I^{6+}$

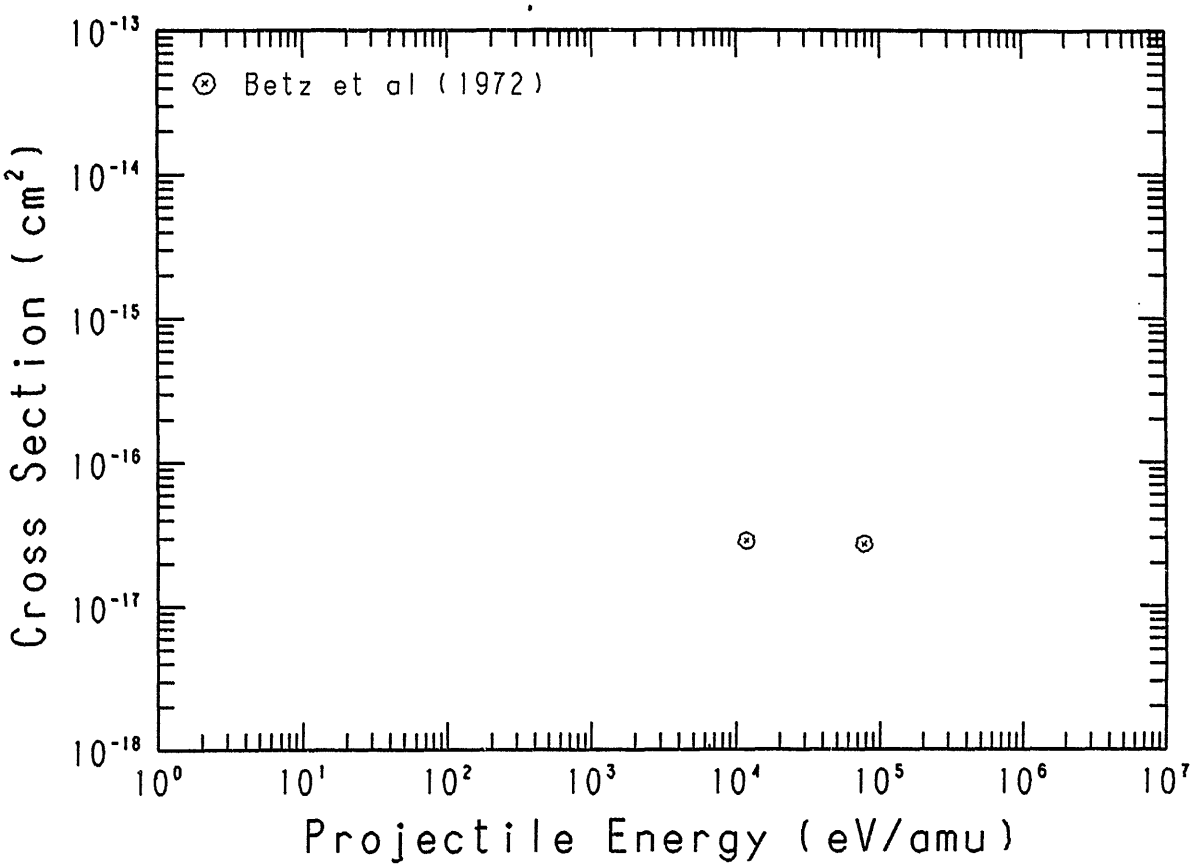


Fig. 128 $I^{8+} + H_2 \rightarrow I^{7+}$

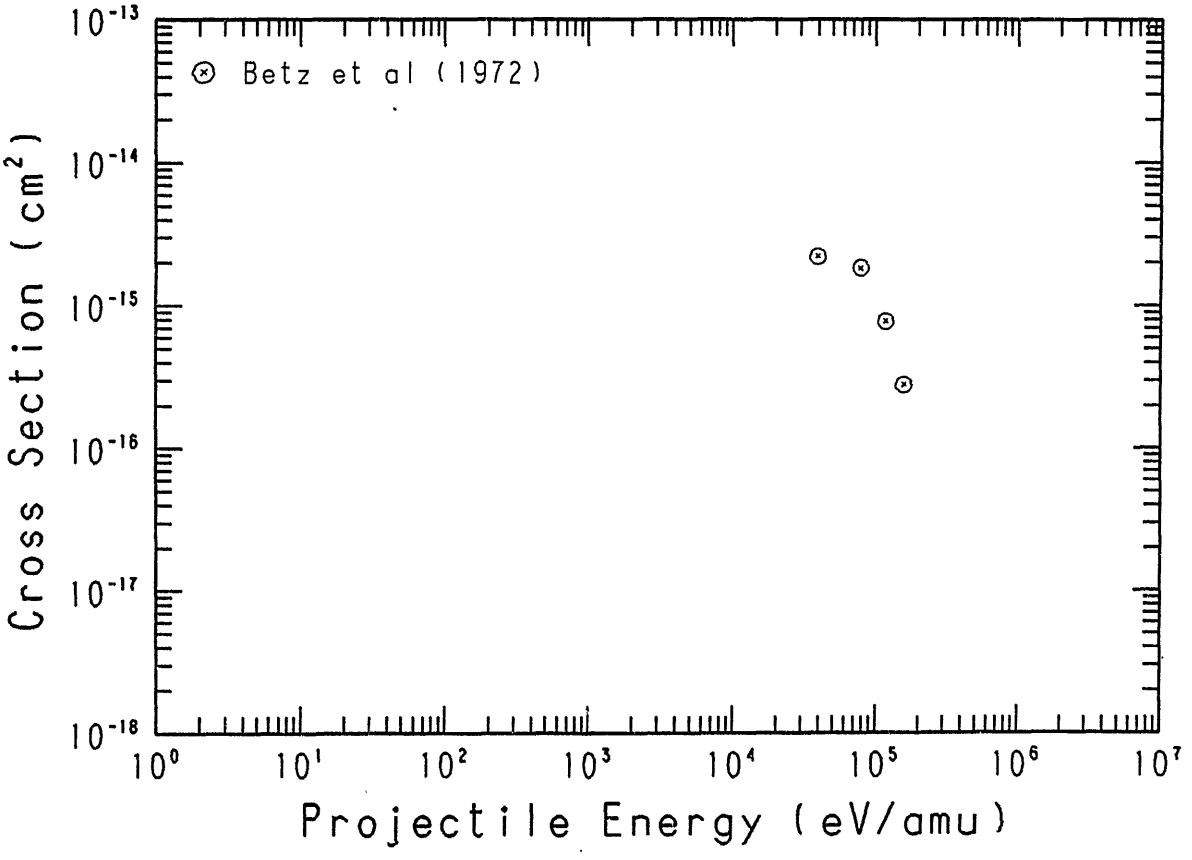


Fig. 129 $I^{9+} + H_2 \rightarrow I^{7+}$

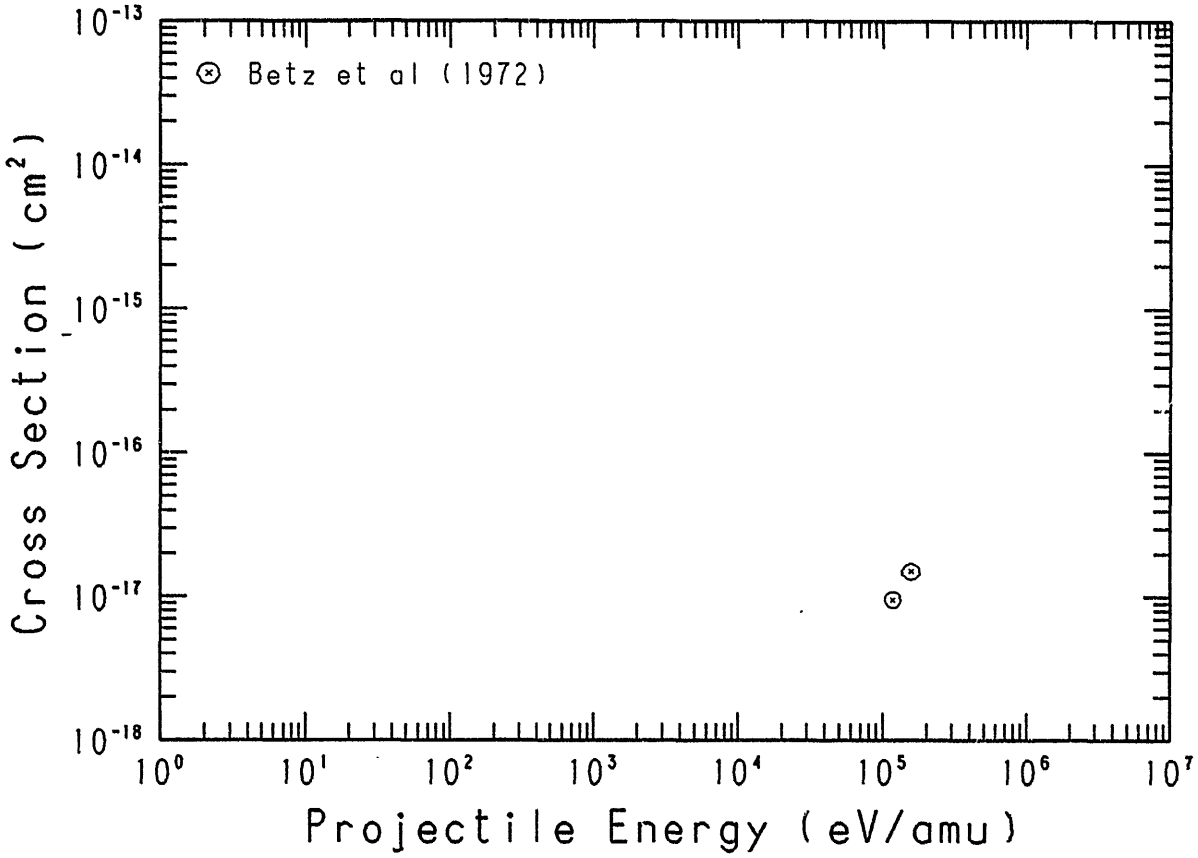


Fig. 130 $I^{9+} + H_2 \rightarrow I^{8+}$

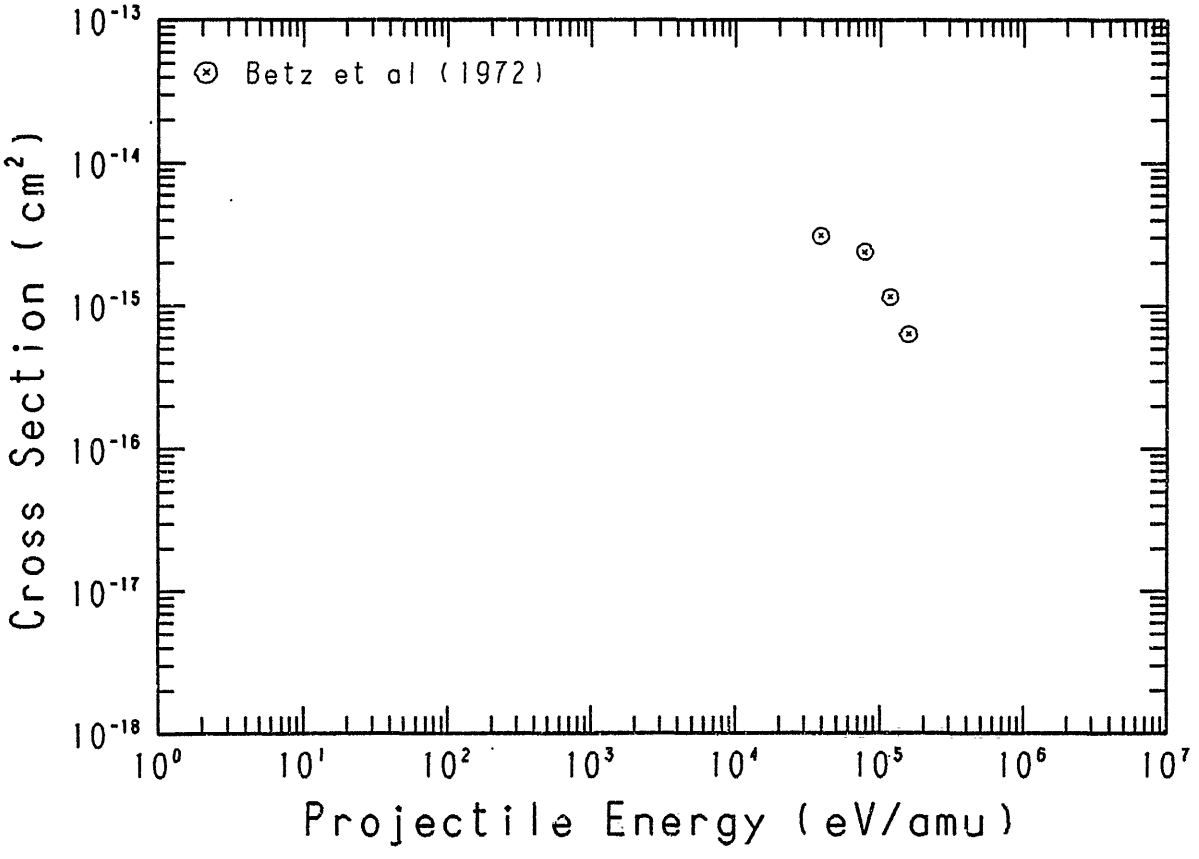


Fig. 131 $I^{10+} + H_2 \rightarrow I^{8+}$

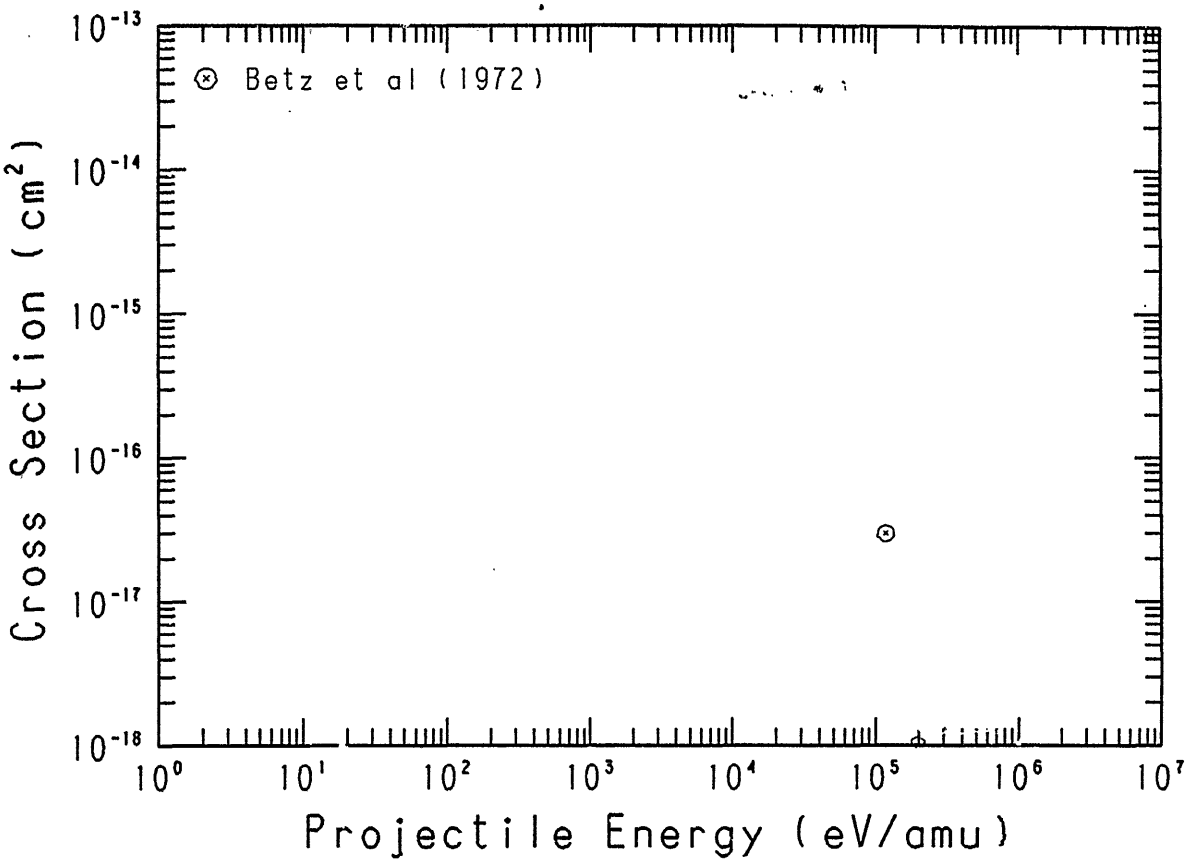


Fig. 132 $I^{10+} + H_2 \rightarrow I^{9+}$

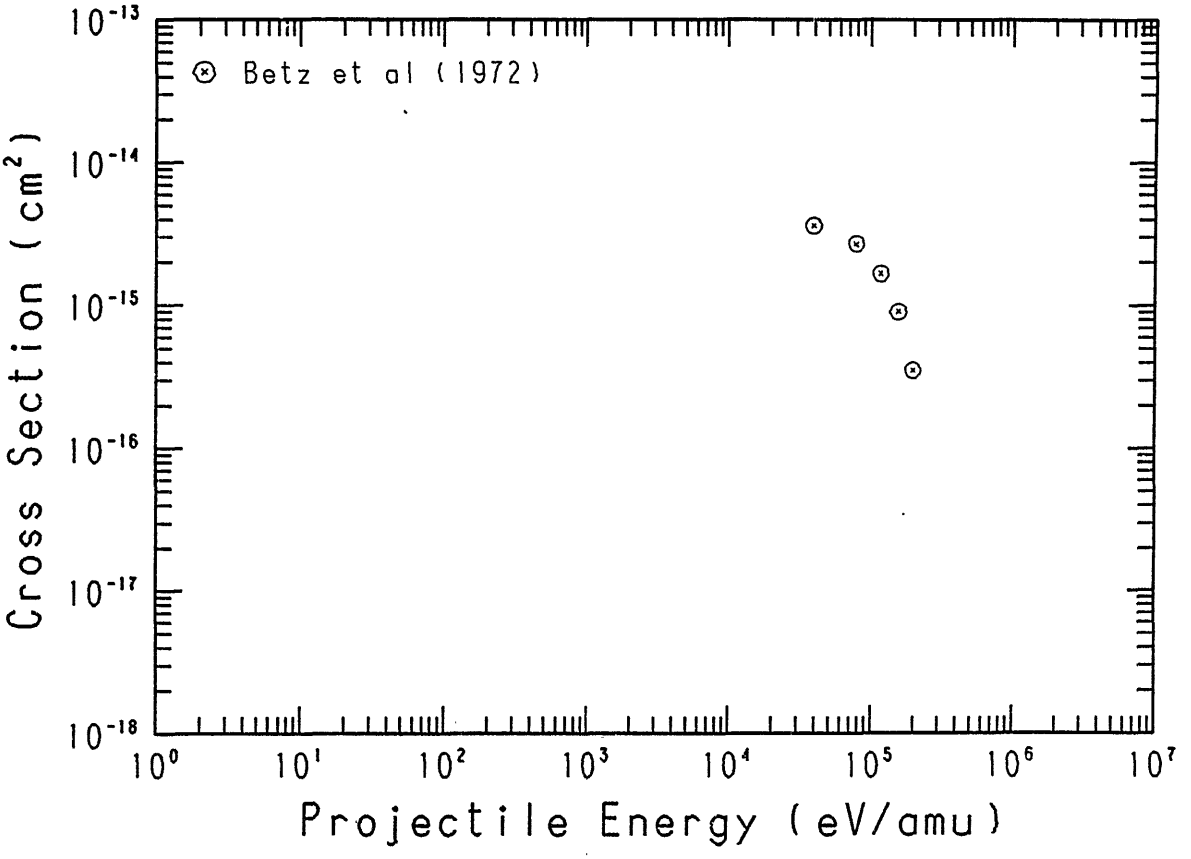


Fig. 133 $I^{11+} + H_2 \rightarrow I^{10+}$

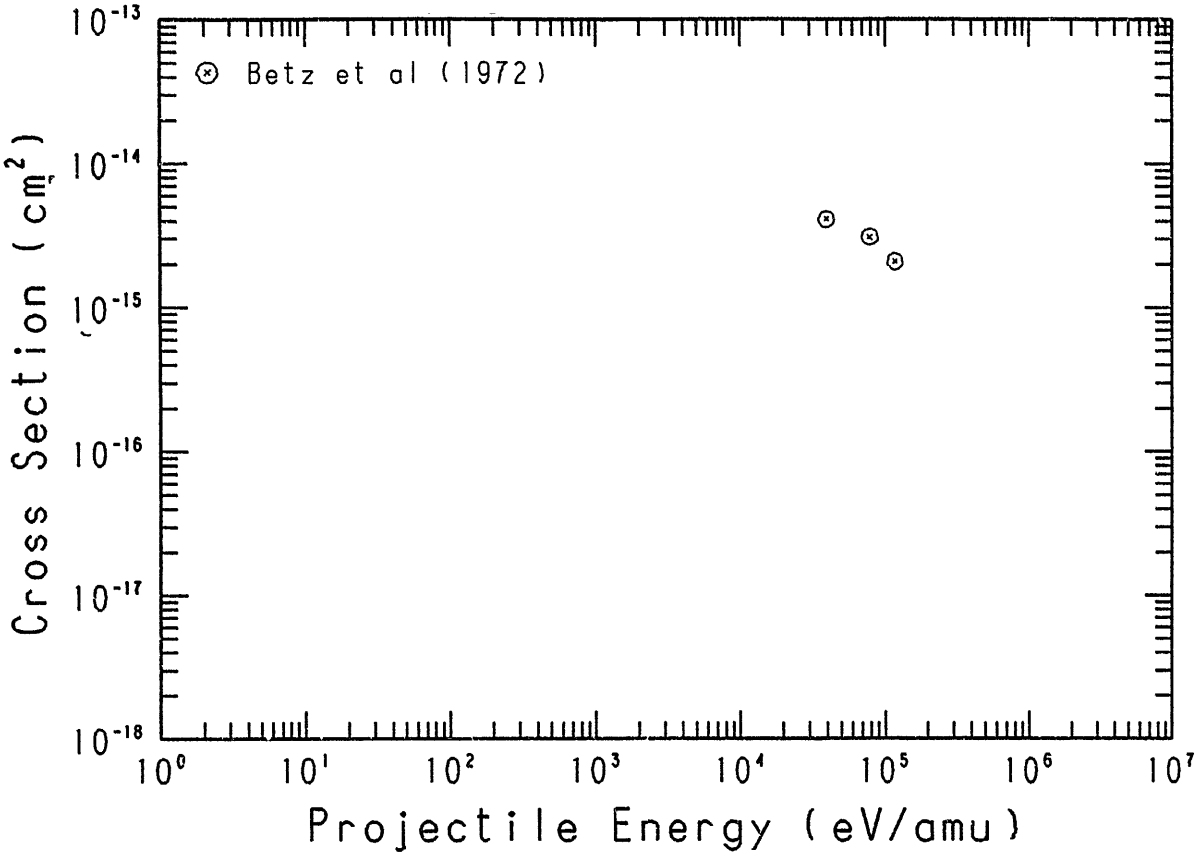


Fig. 134 $I^{12+} + H_2 \rightarrow I^{11+}$

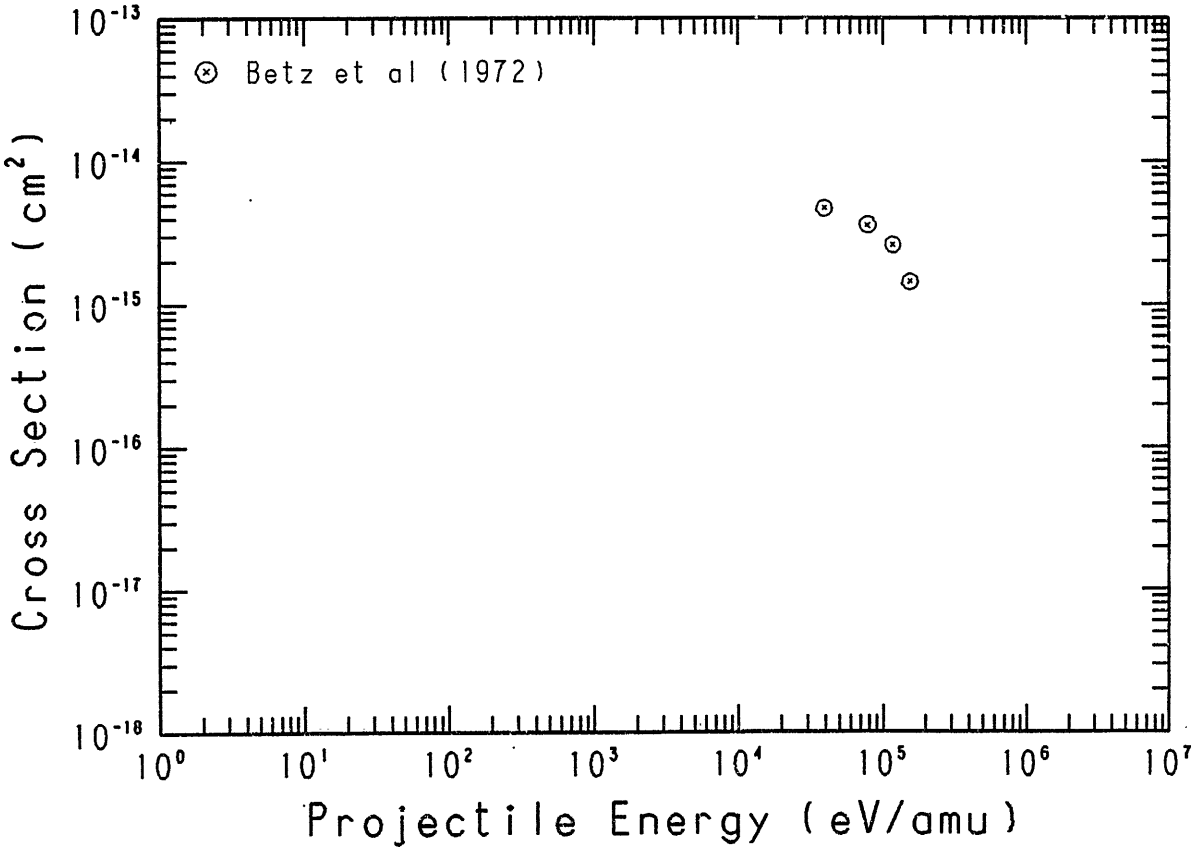


Fig. 135 $I^{13+} + H_2 \rightarrow I^{12+}$

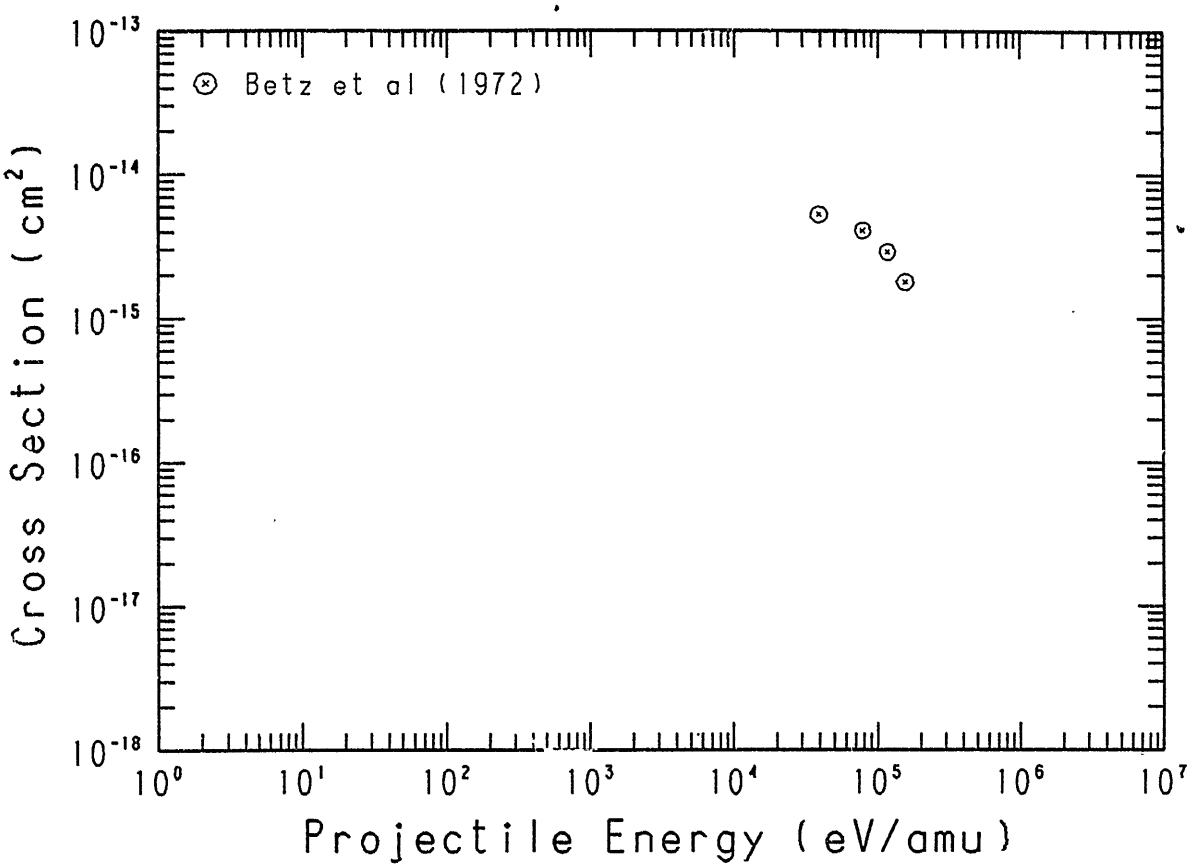


Fig. 136 $I^{14+} + H_2 \rightarrow I^{13+}$

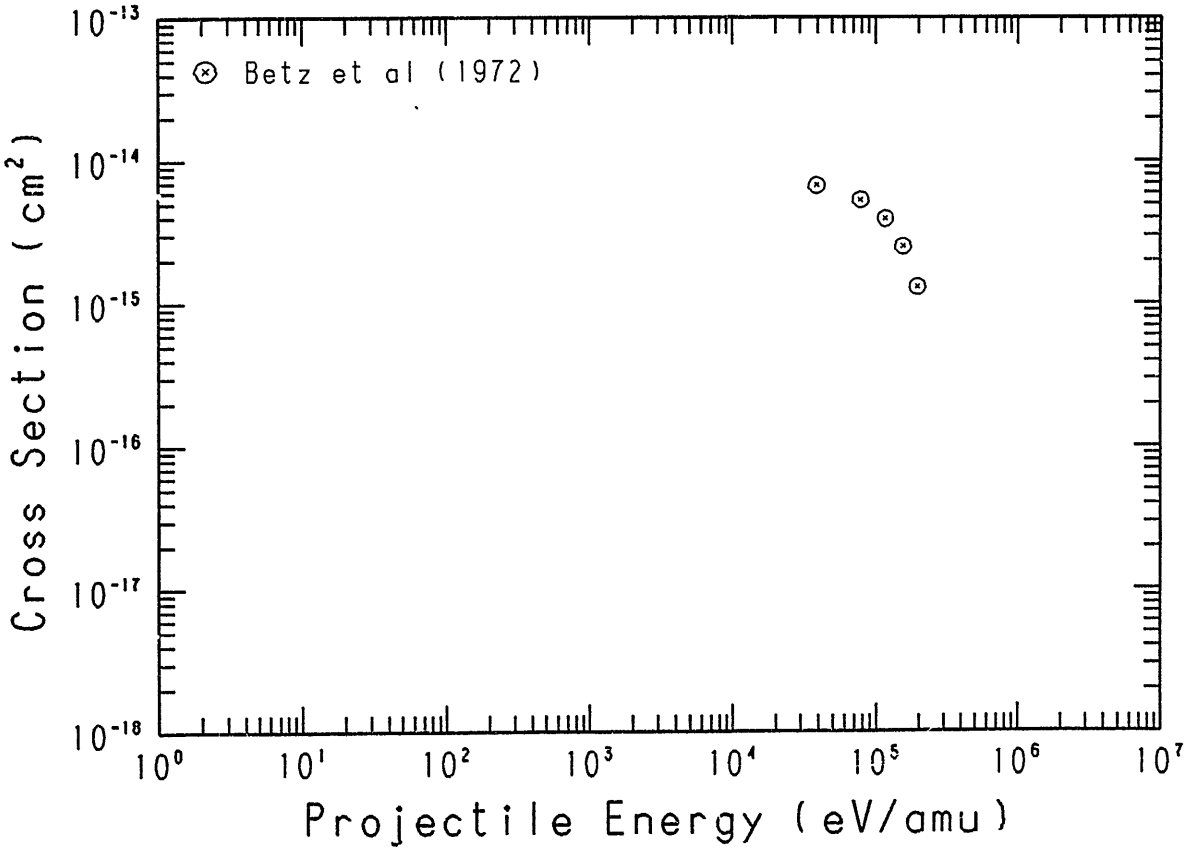


Fig. 137 $I^{15+} + H_2 \rightarrow I^{14+}$

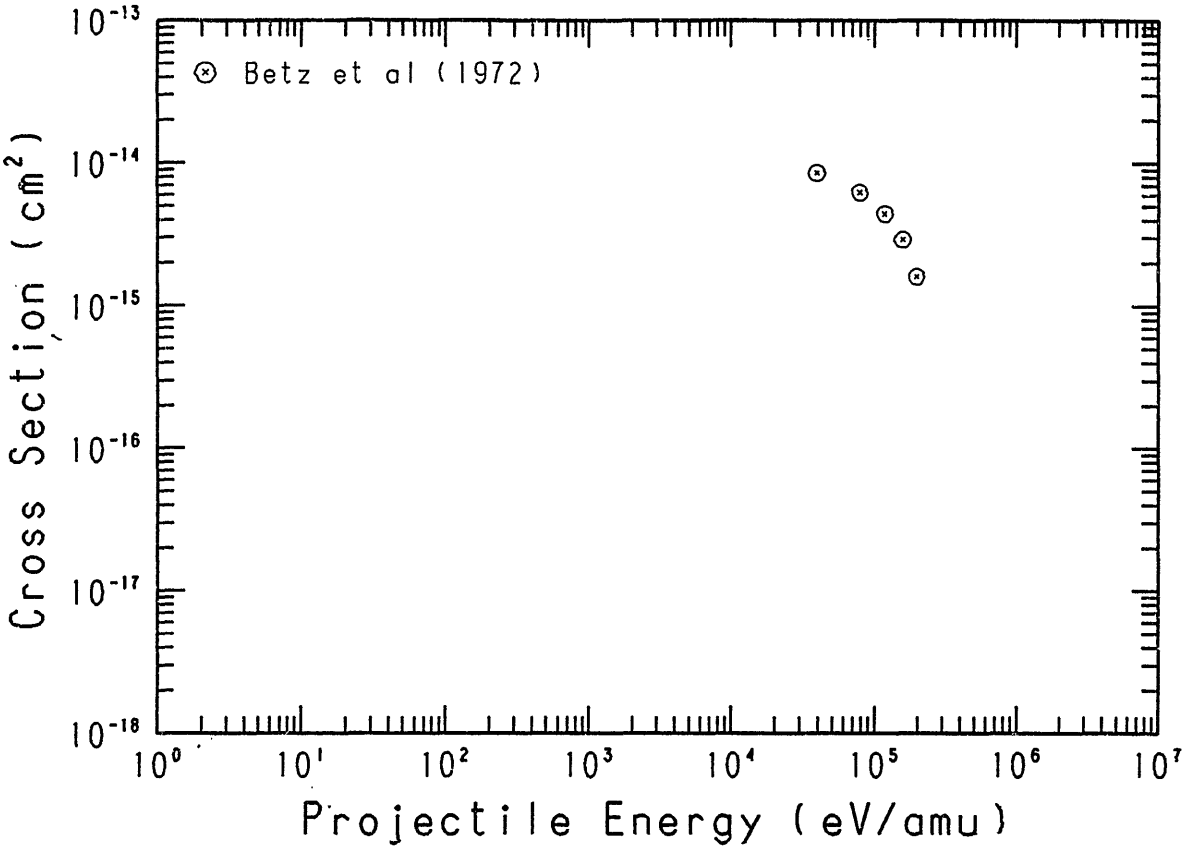


Fig. 138 $I^{16+} + H_2 \rightarrow I^{15+}$

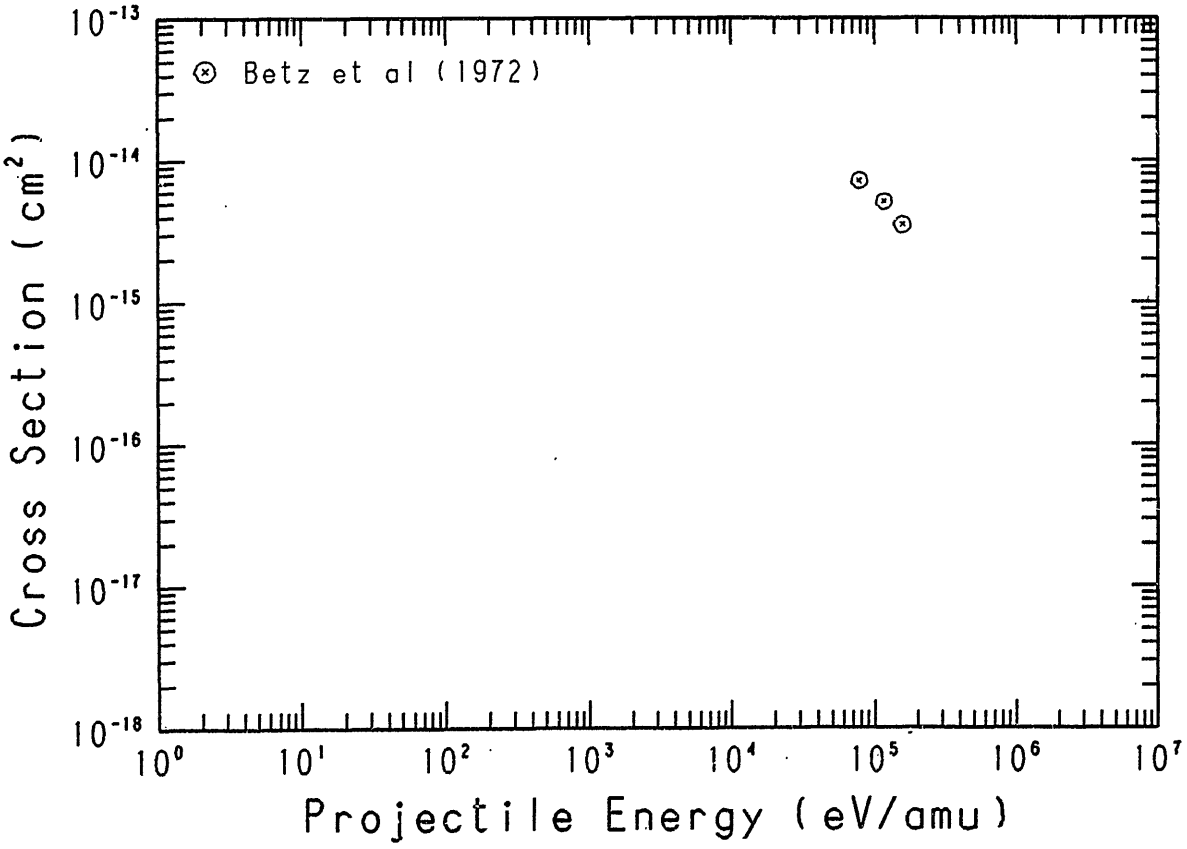


Fig. 139 $I^{17+} + H_2 \rightarrow I^{16+}$

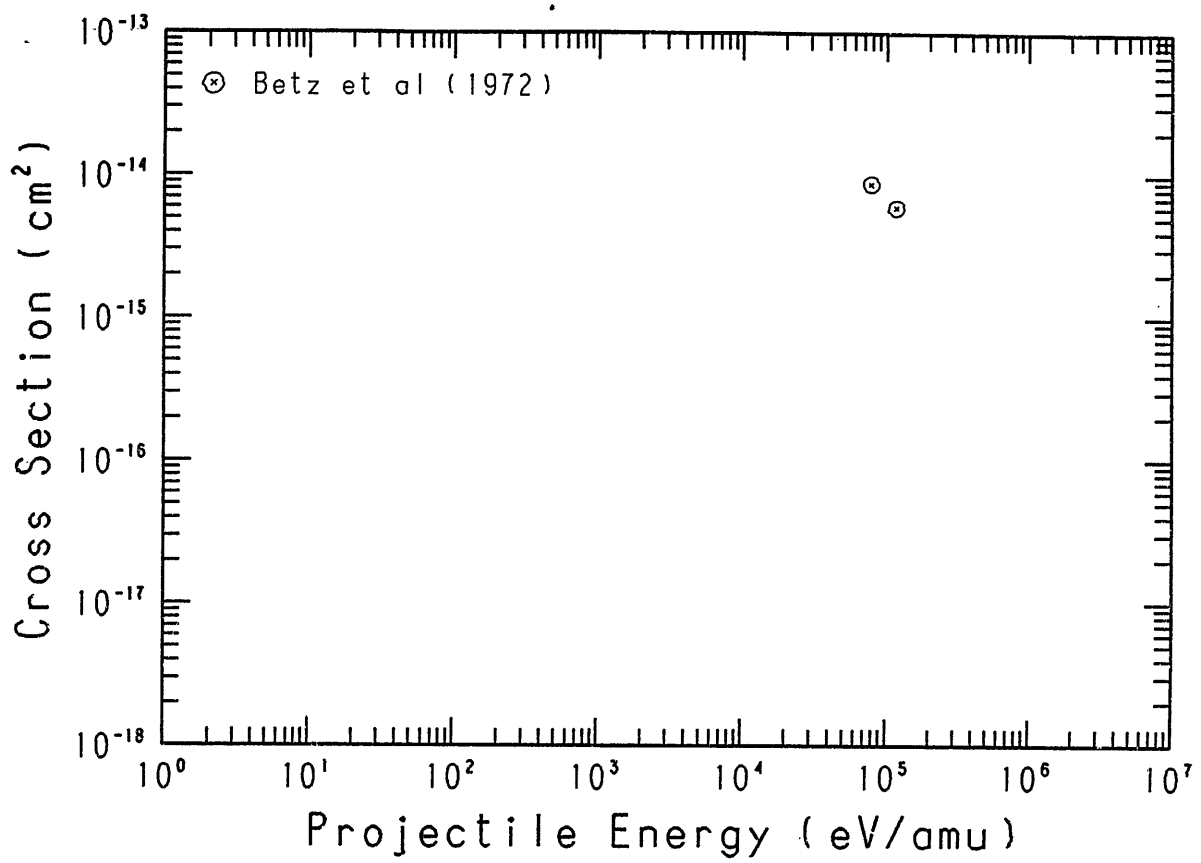


Fig. 140 $I^{18+} + H_2 \rightarrow I^{17+}$

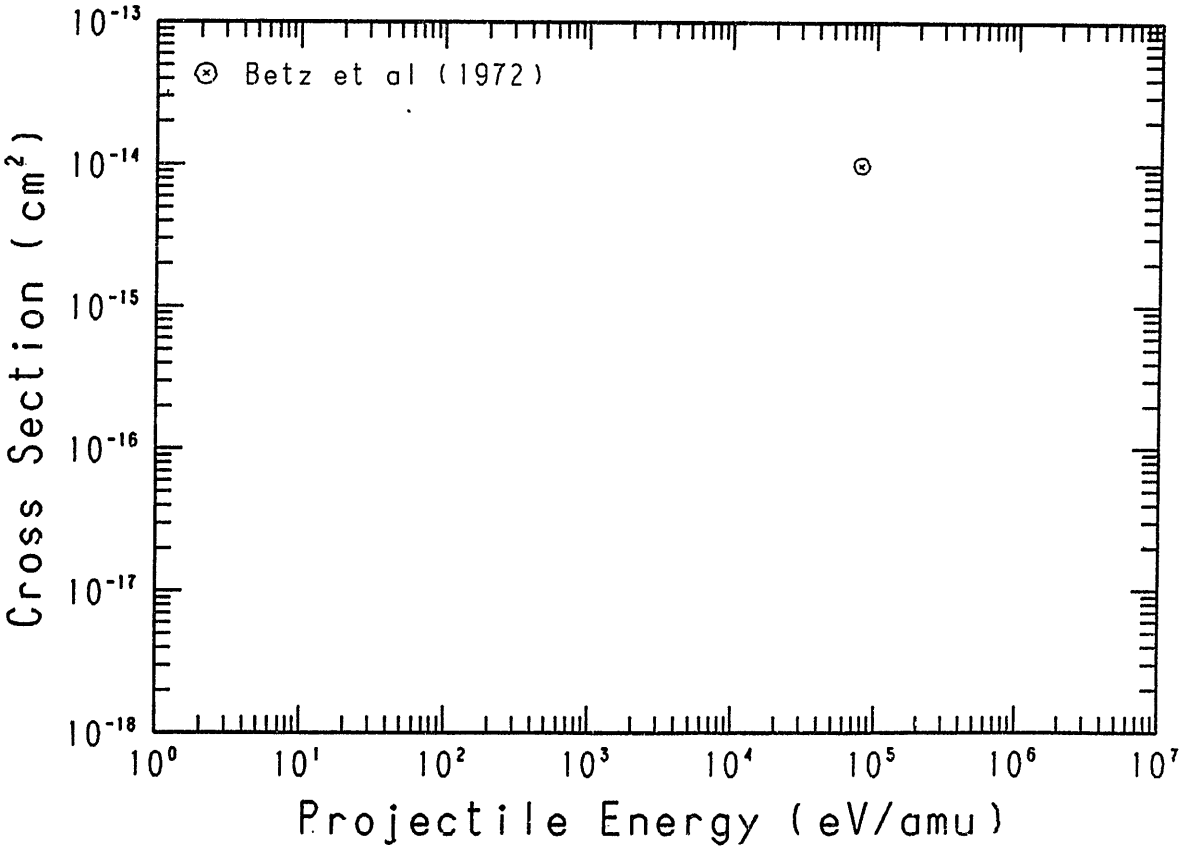


Fig. 141 $Xe^{2+} + H_2 \rightarrow Xe^{+}$

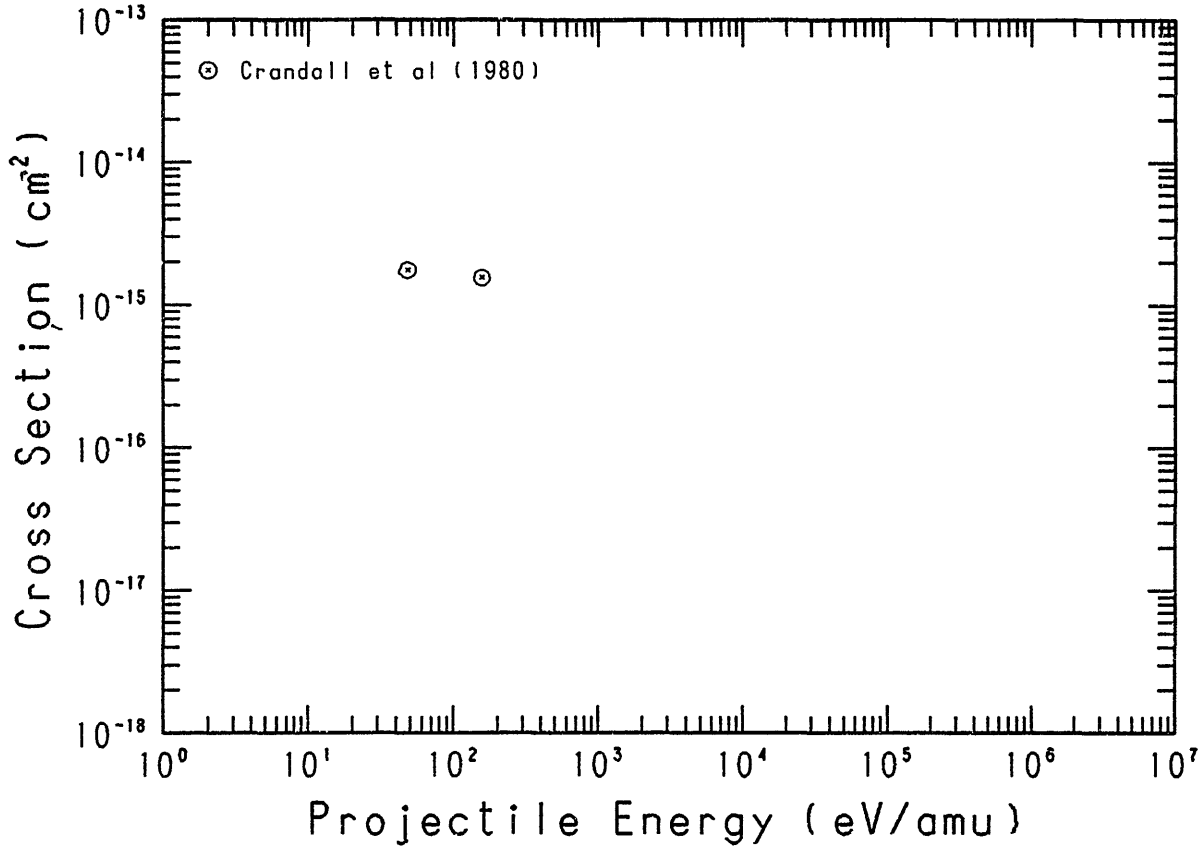


Fig. 142 $Xe^{3+} + H_2 \rightarrow Xe^{2+}$

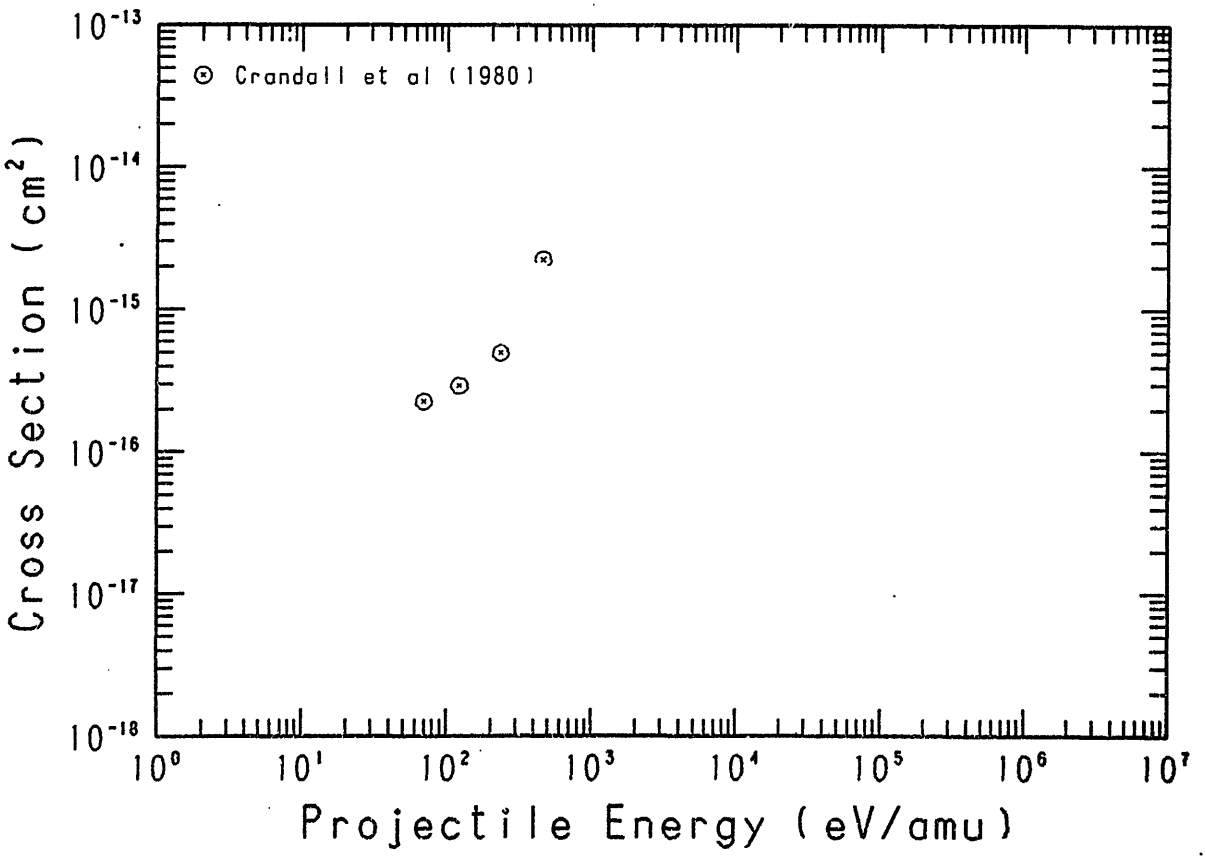


Fig. 143 $Xe^{4+} + H_2 \rightarrow Xe^{3+}$

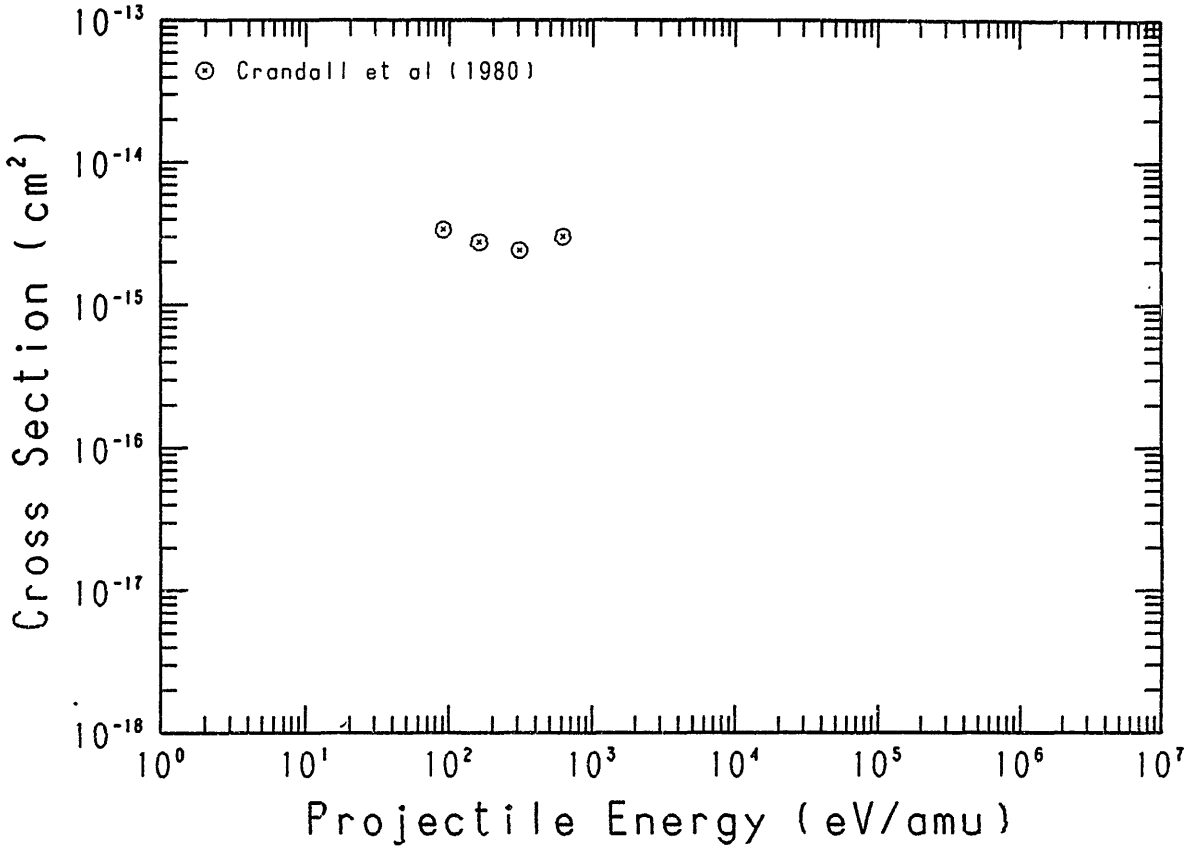


Fig. 144 $Xe^{5+} + H_2 \rightarrow Xe^{4+}$

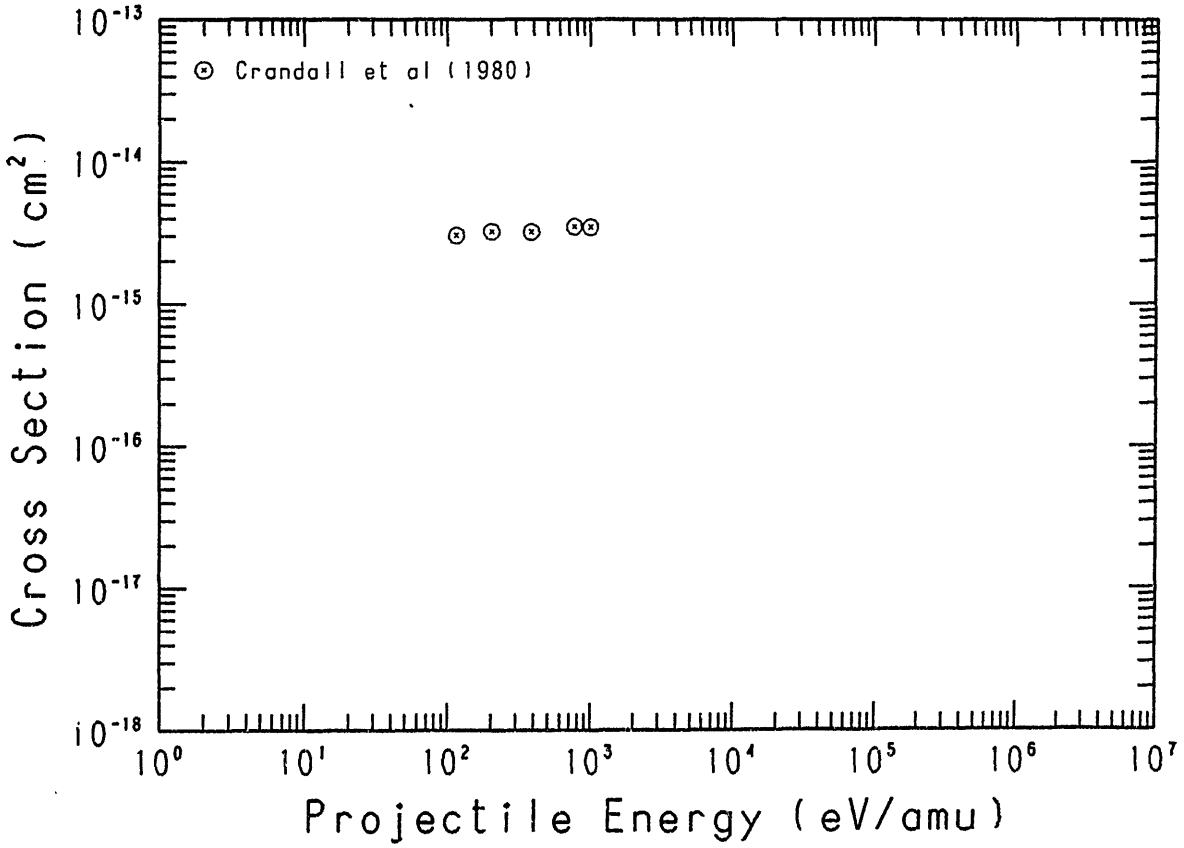


Fig. 145 $Xe^{6+} + H_2 \rightarrow Xe^{5+}$

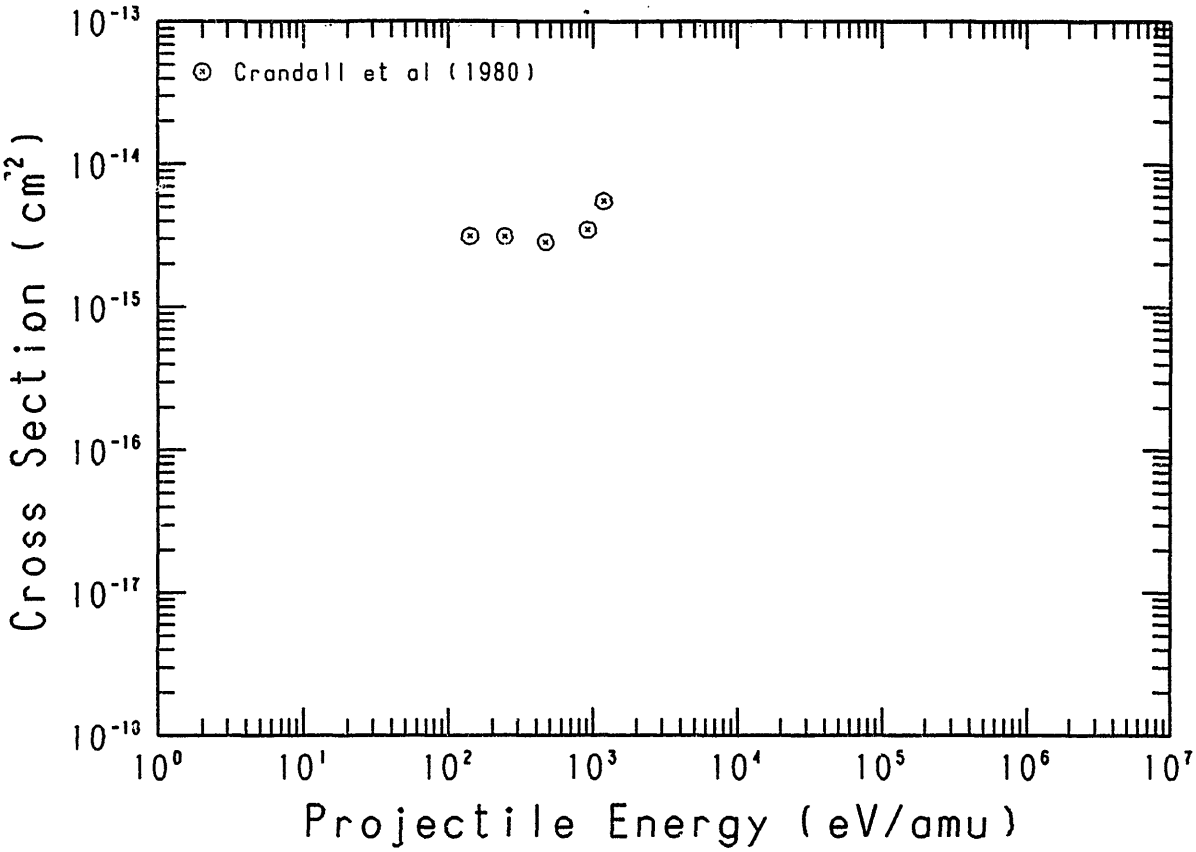


Fig. 146 $Xe^{7+} + H_2 \rightarrow Xe^{6+}$

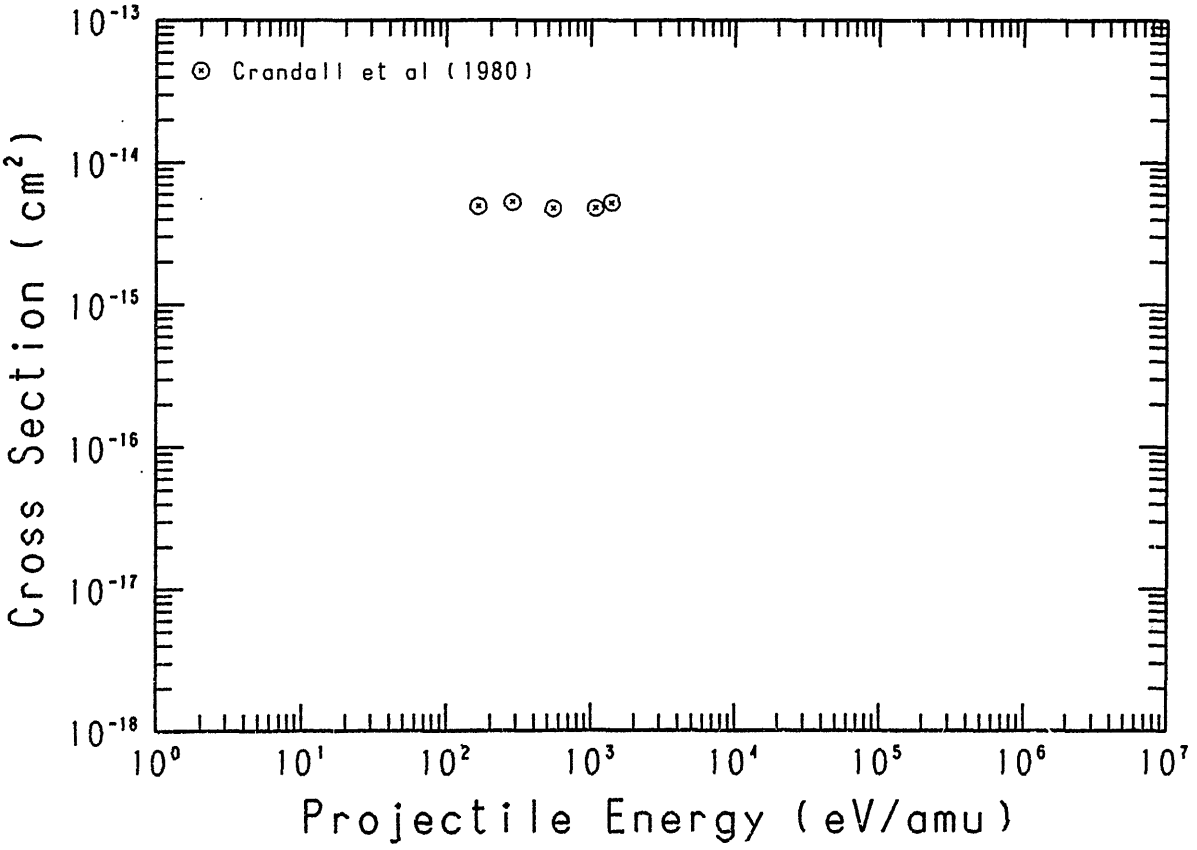


Fig. 147 $Xe^{8+} + H_2 \rightarrow Xe^{7+}$

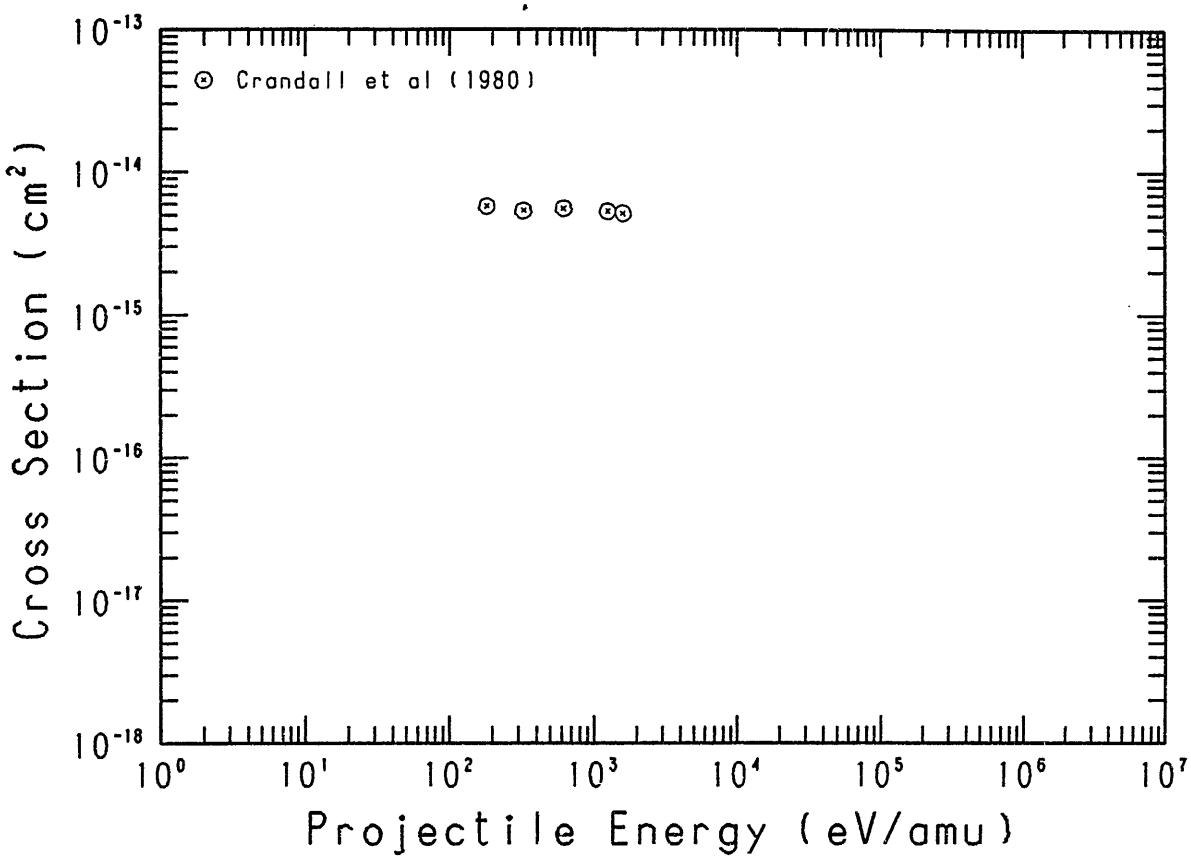


Fig. 148 $Xe^{9+} + H_2 \rightarrow Xe^{8+}$

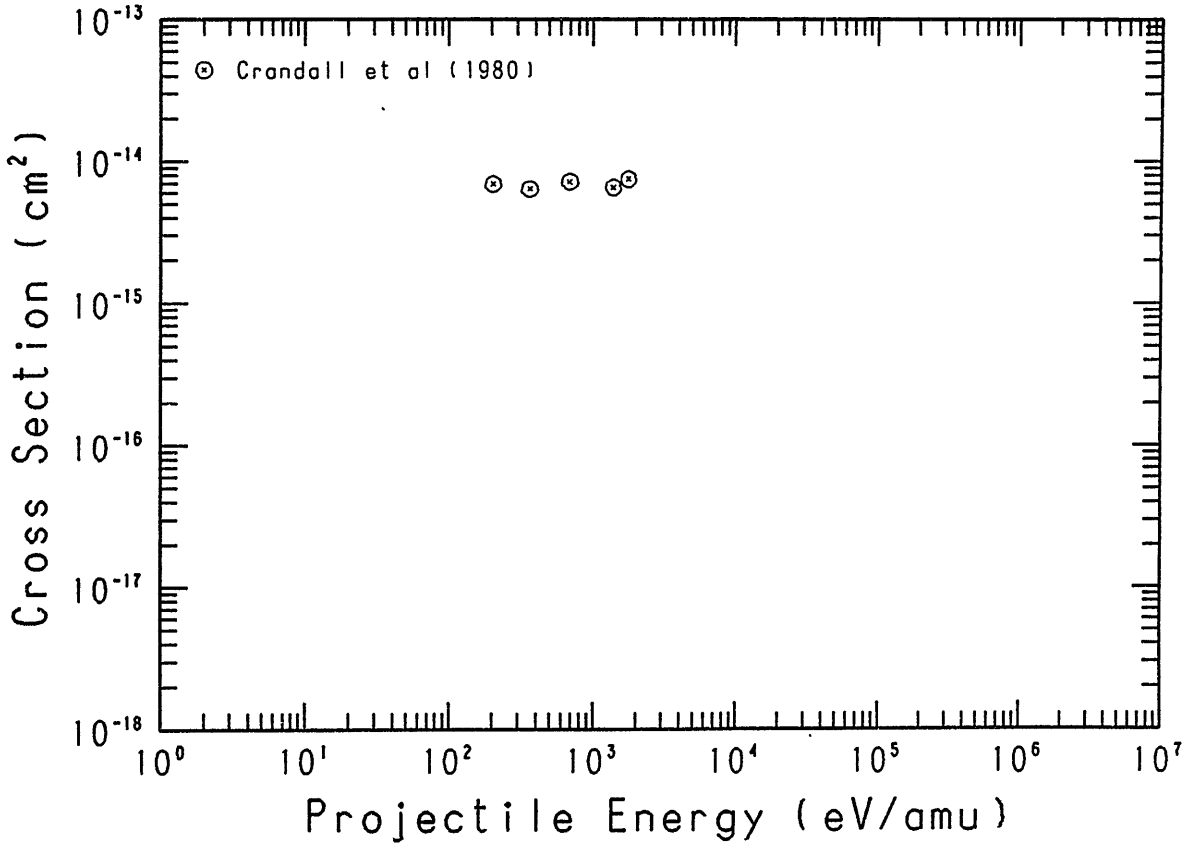


Fig. 149 $Xe^{10+} + H_2 \rightarrow Xe^{9+}$

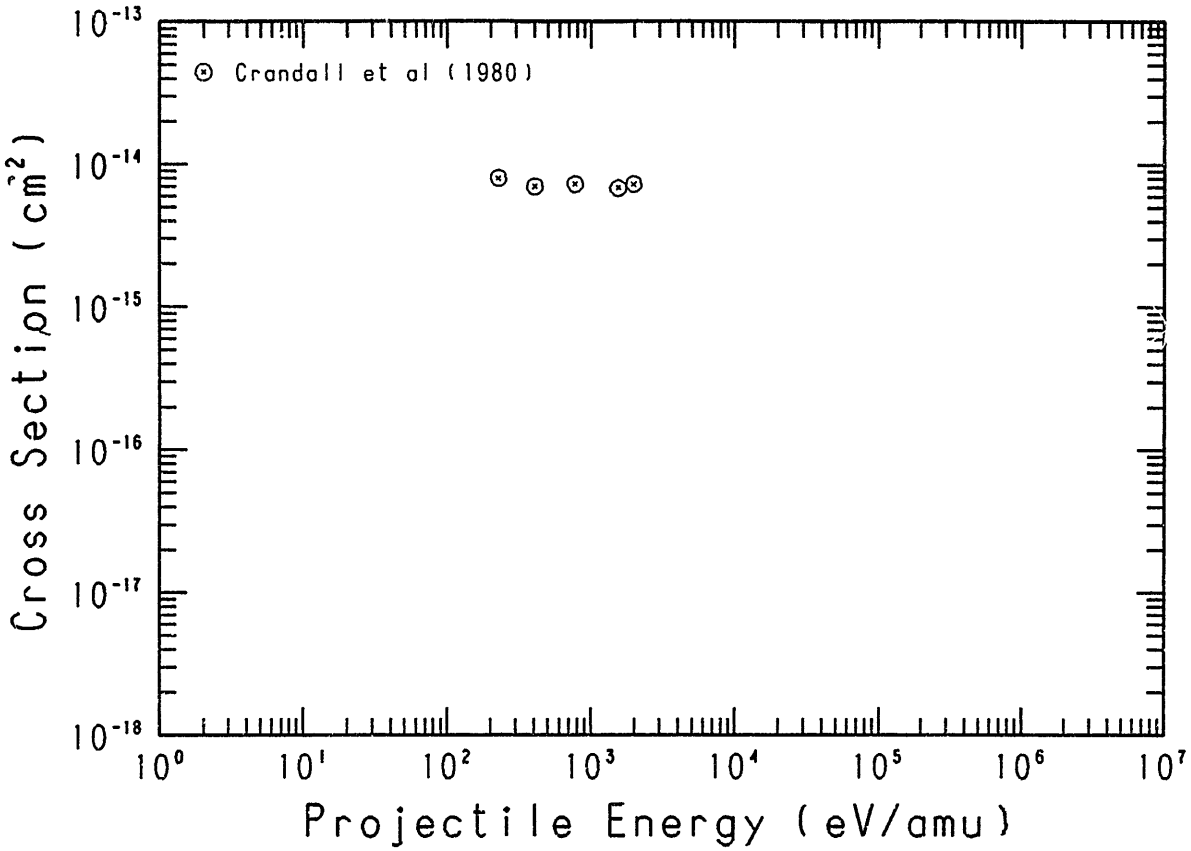


Fig. 150 $Xe^{11+} + H_2 \rightarrow Xe^{10+}$

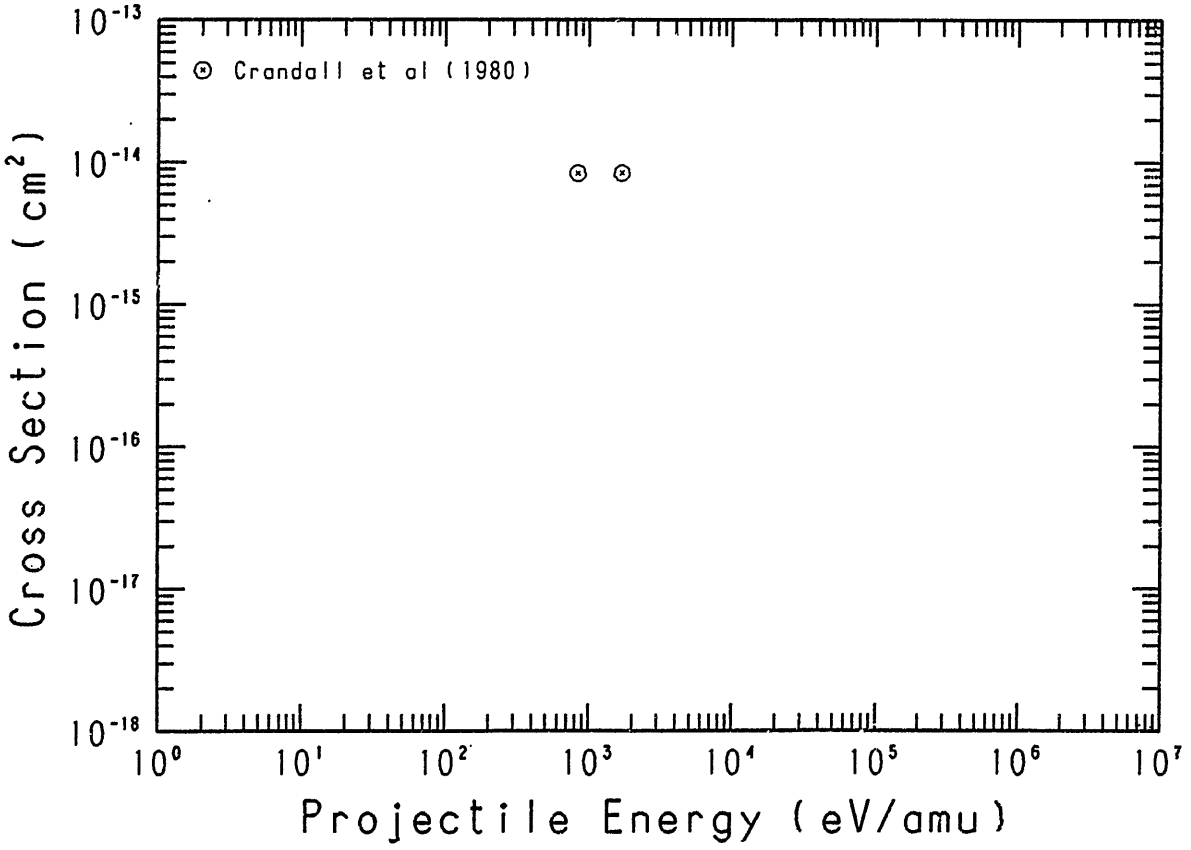


Fig. 151 $Xe^{12+} + H_2 \rightarrow Xe^{11+}$

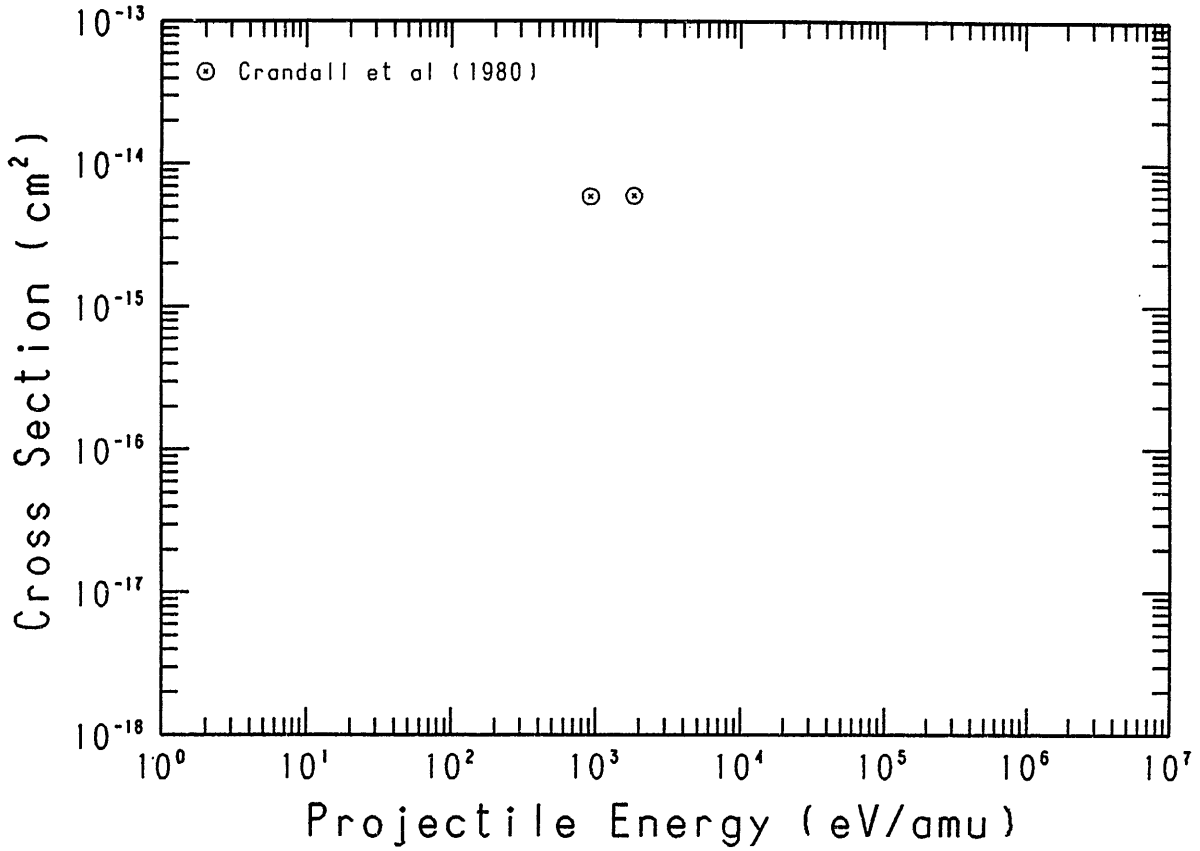


Fig. 152 $Ba^{2+} + H_2 \rightarrow Ba^{+}$

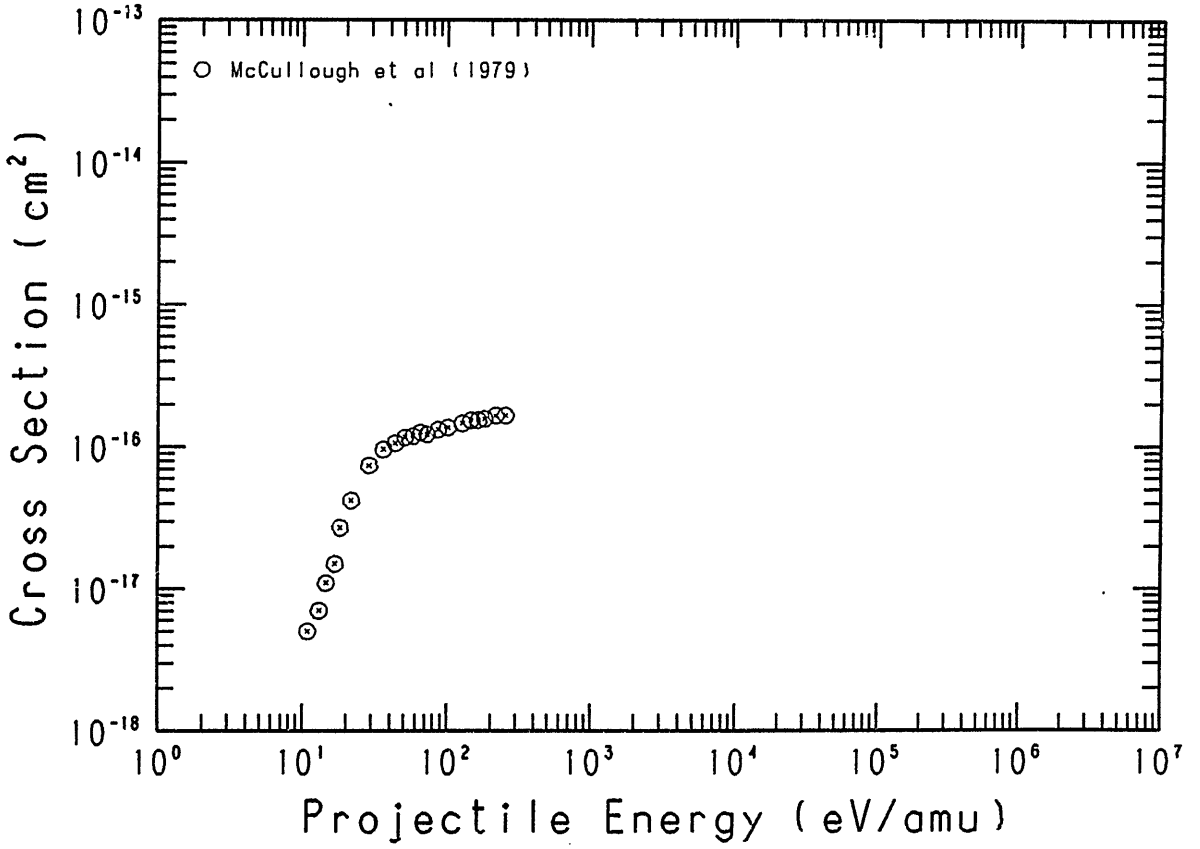


Fig. 153 $Ta^{3+} + H_2 \rightarrow Ta^{2+}$

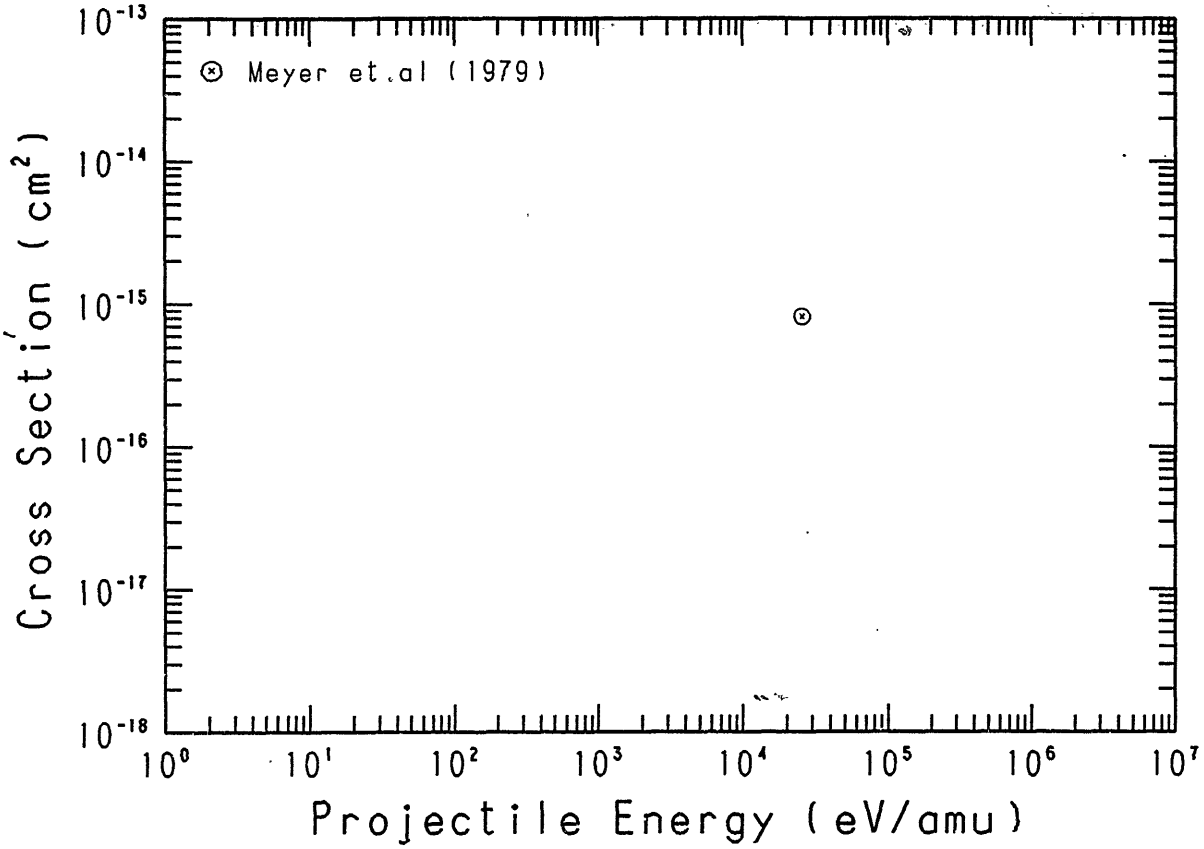


Fig. 154 $Ta^{4+} + H_2 \rightarrow Ta^{3+}$

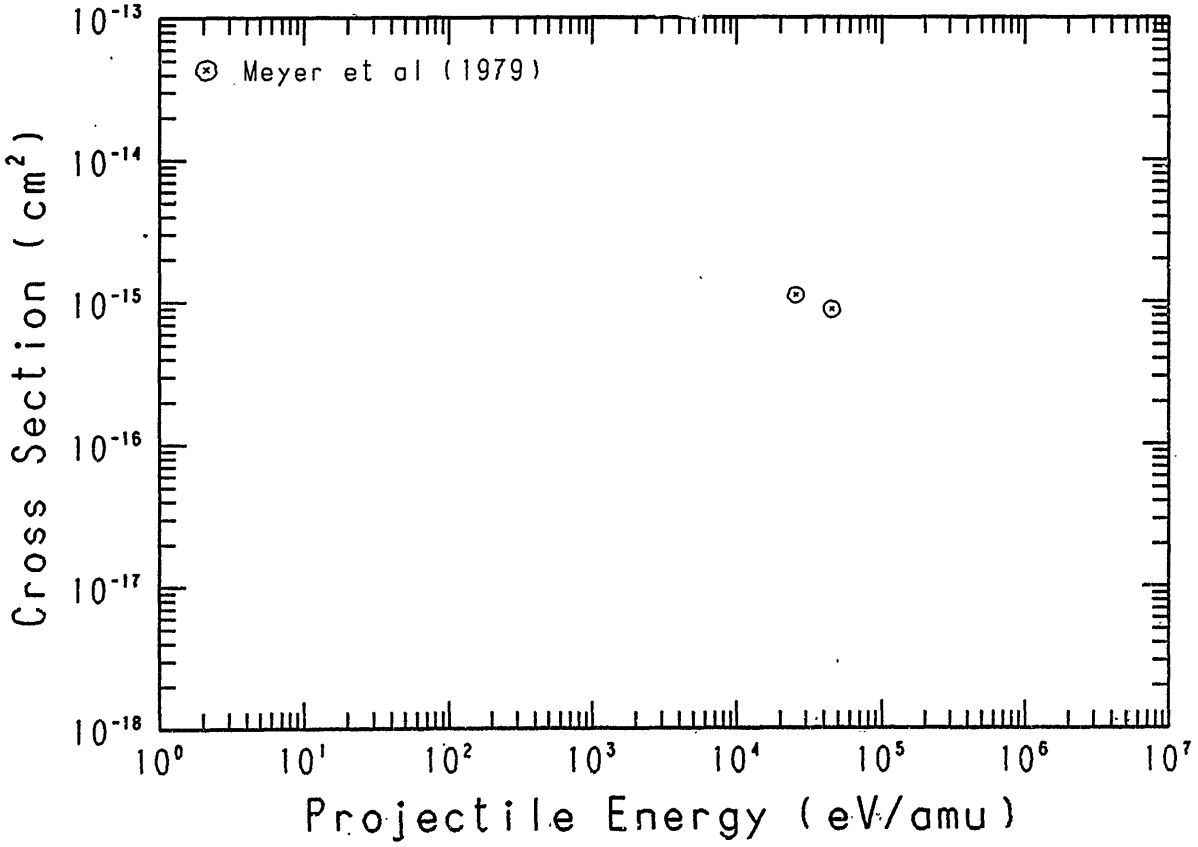


Fig. 155 $Ta^{5+} + H_2 \rightarrow Ta^{4+}$

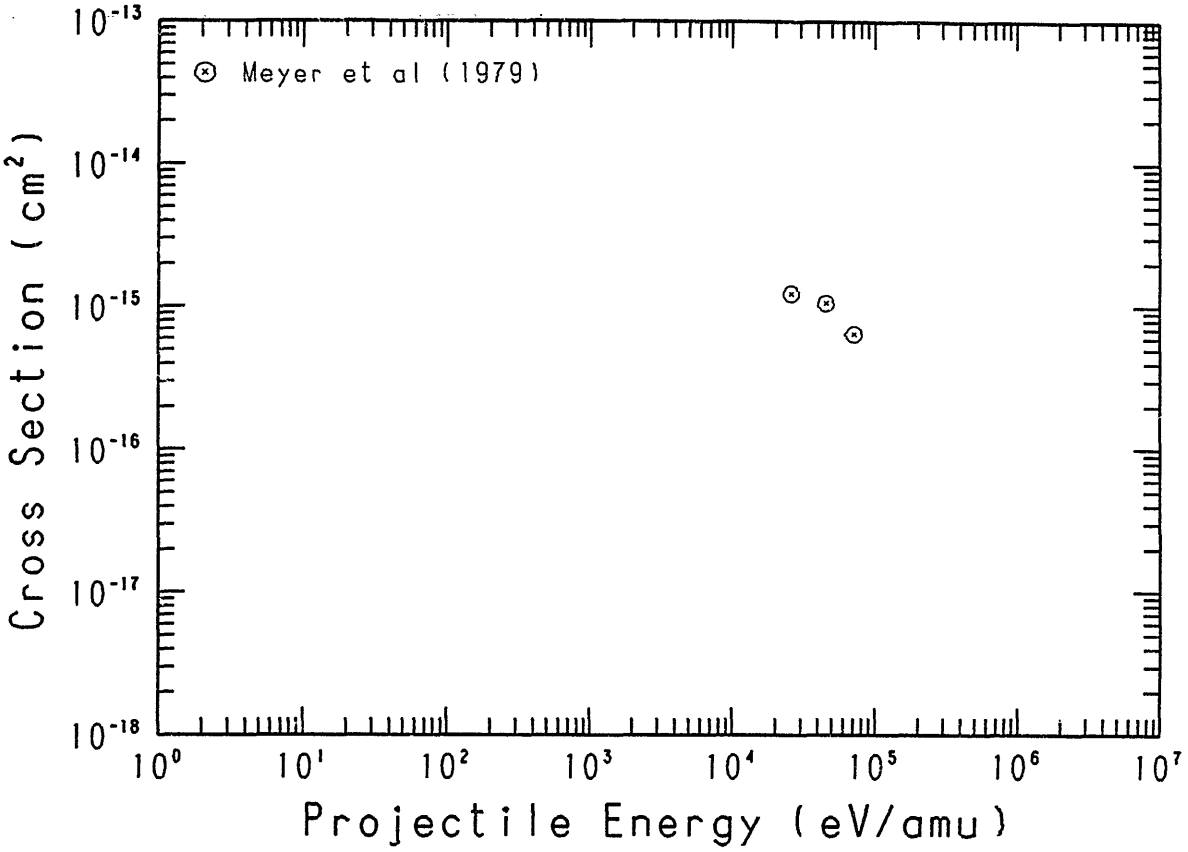


Fig. 156 $Ta^{6+} + H_2 \rightarrow Ta^{5+}$

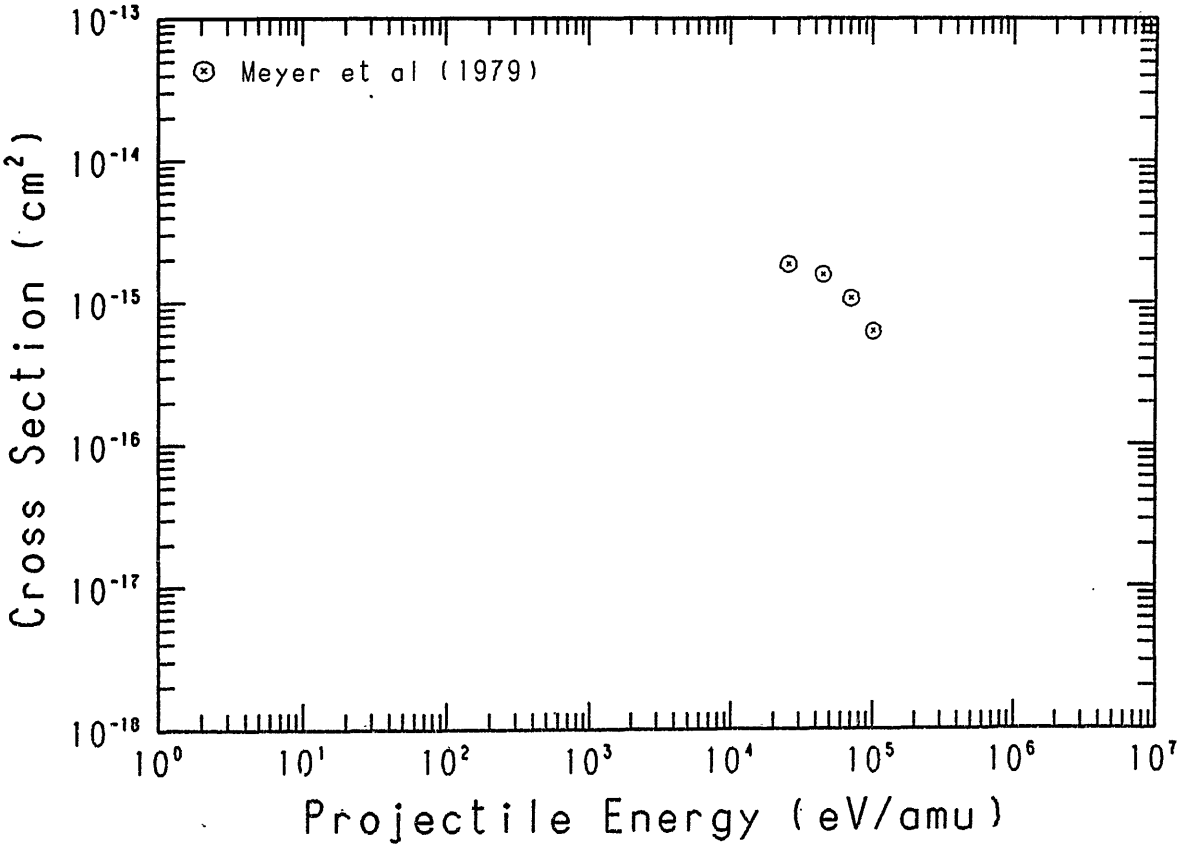


Fig. 157 $Ta^{7+} + H_2 \rightarrow Ta^{6+}$

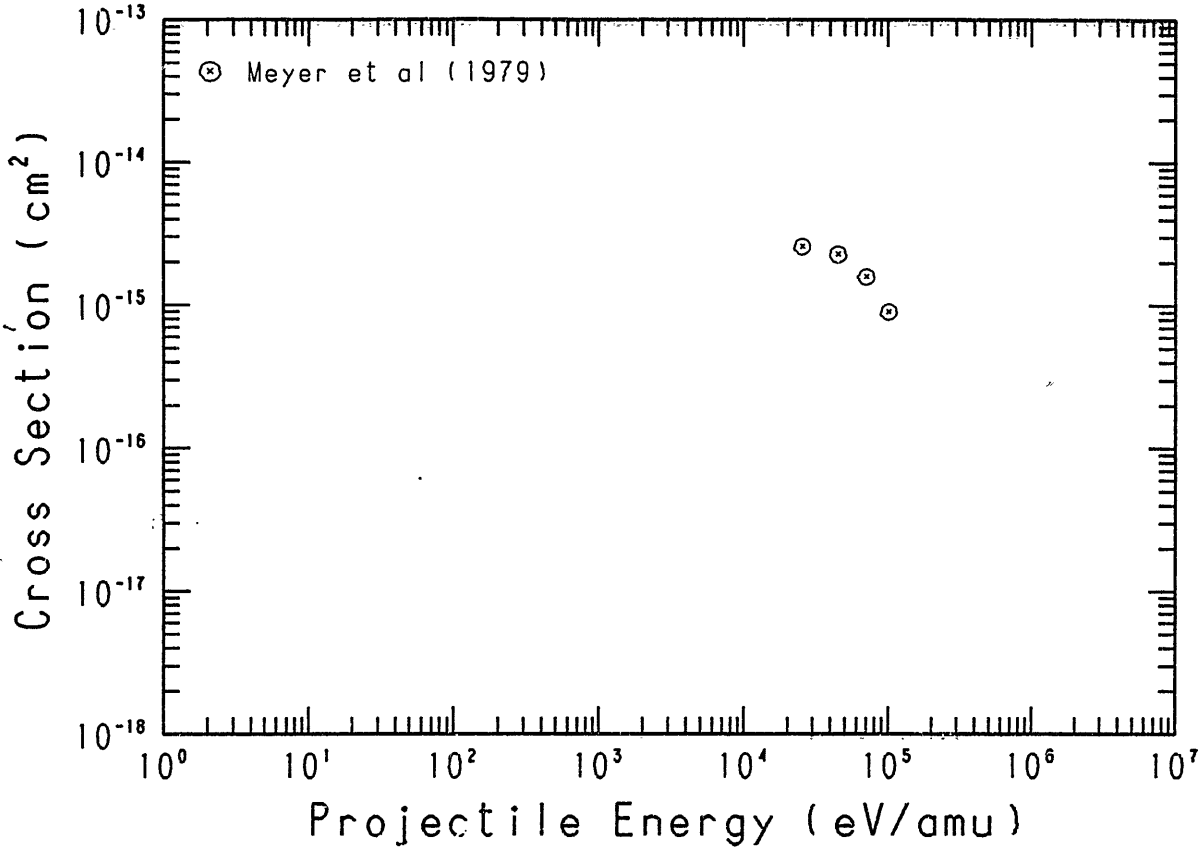


Fig. 158 $Ta^{8+} + H_2 \rightarrow Ta^{7+}$

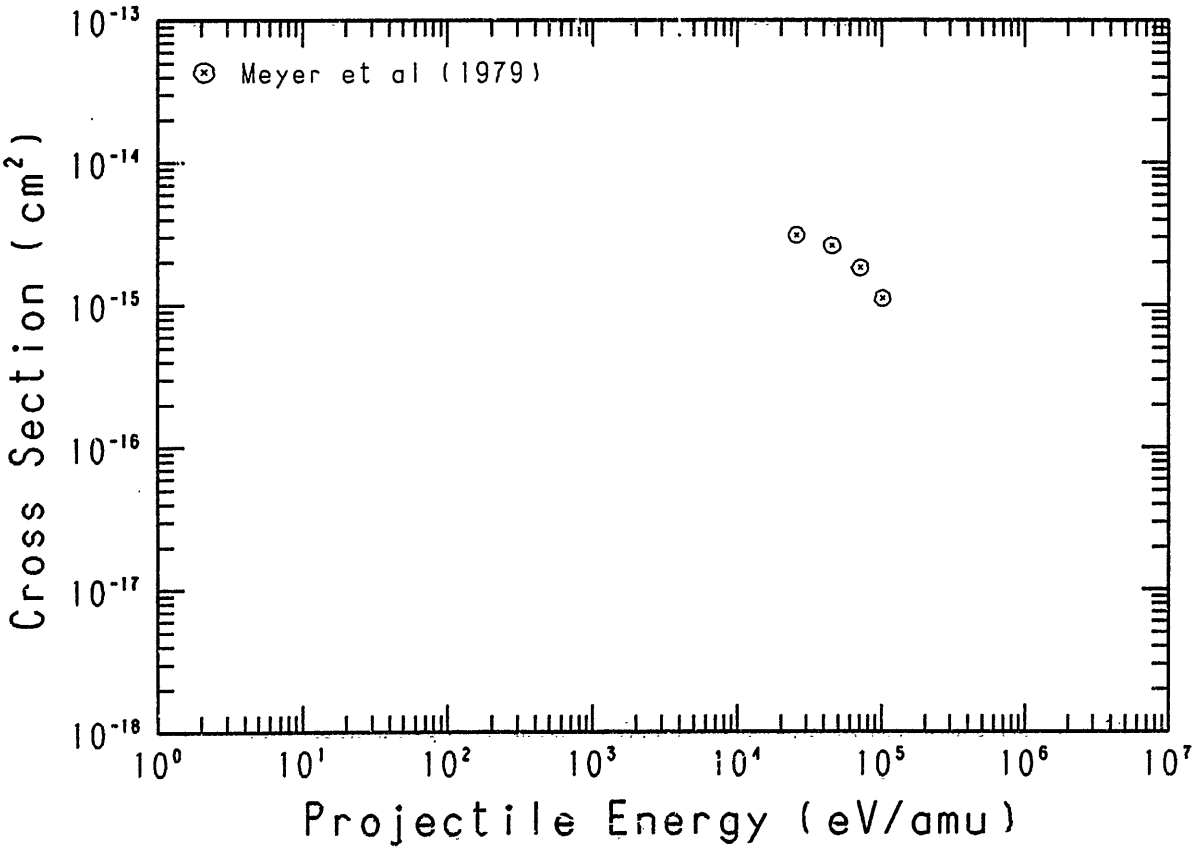


Fig. 159 $Ta^{9+} + H_2 \rightarrow Ta^{8+}$

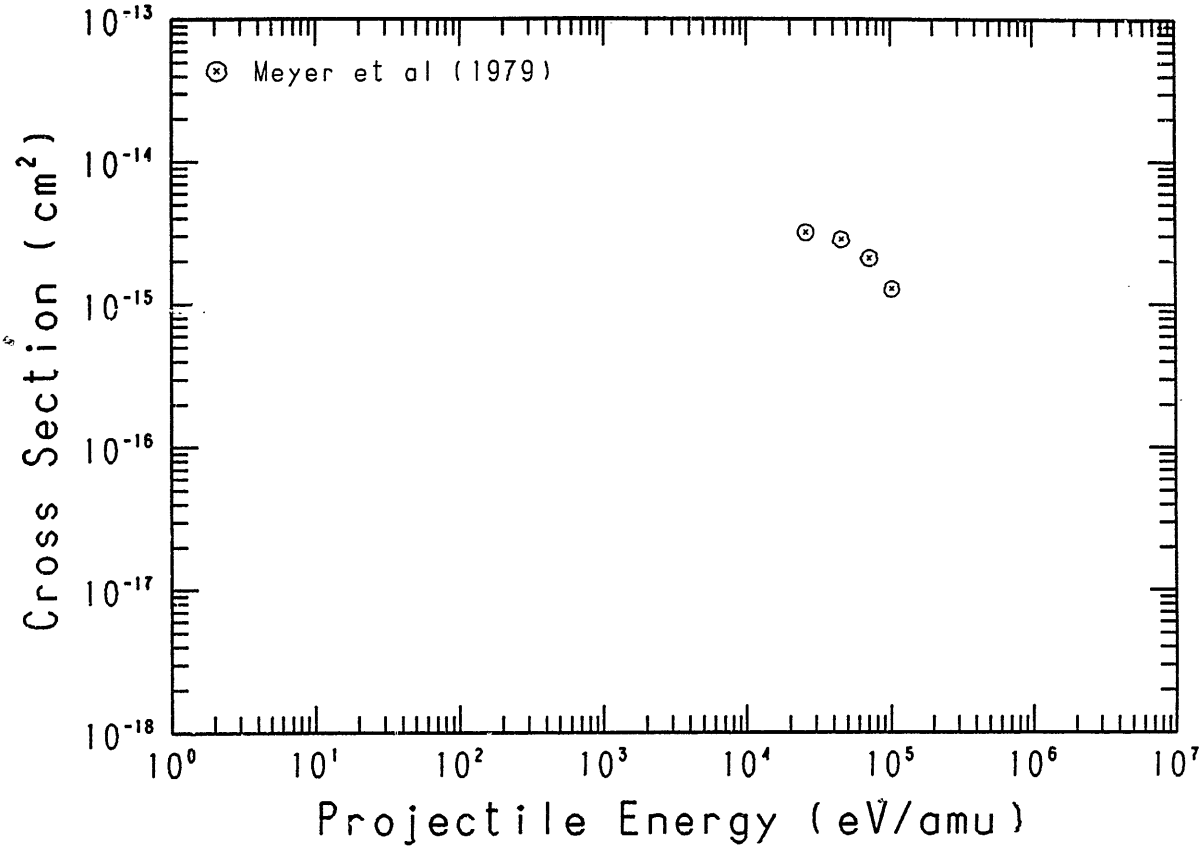


Fig. 160 $Ta^{10+} + H_2 \rightarrow Ta^{9+}$

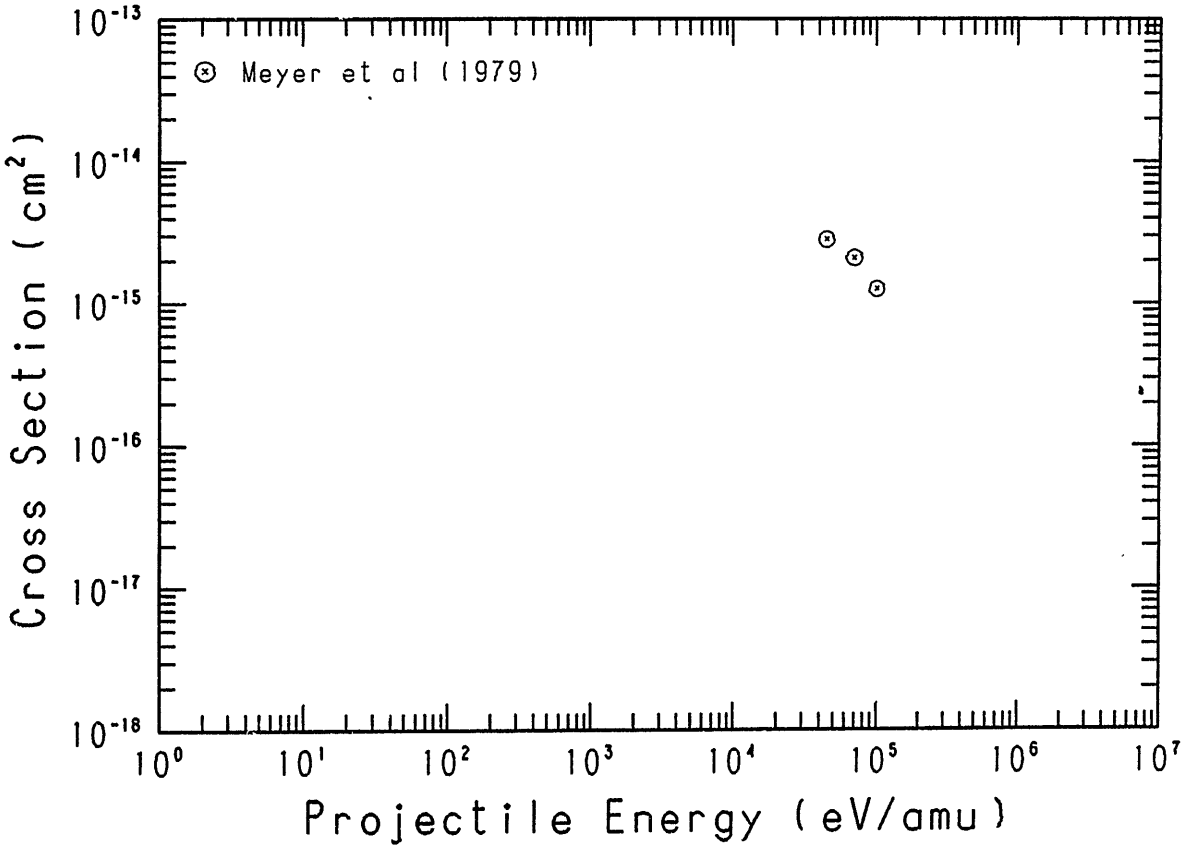


Fig. 161 $Ta^{11+} + H_2 \rightarrow Ta^{10+}$

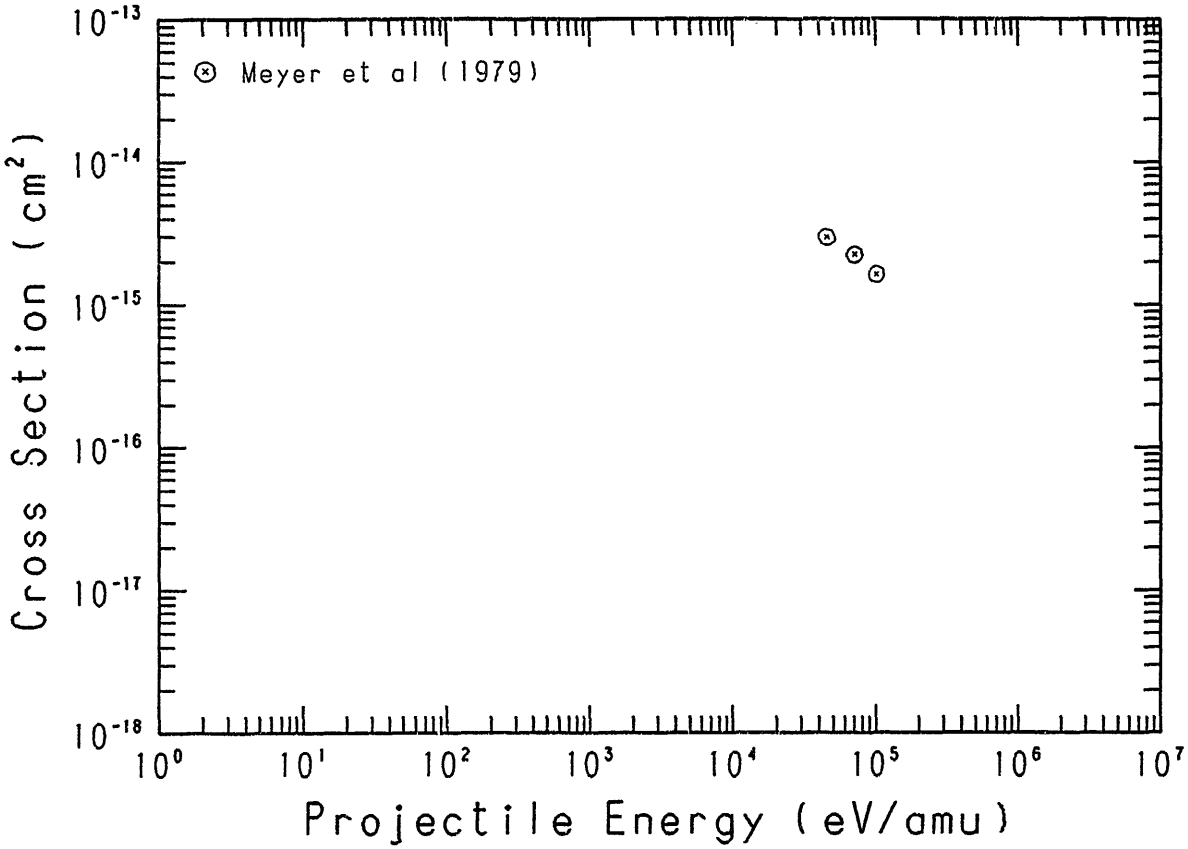


Fig. 162 $Ta^{12+} + H_2 \rightarrow Ta^{11+}$

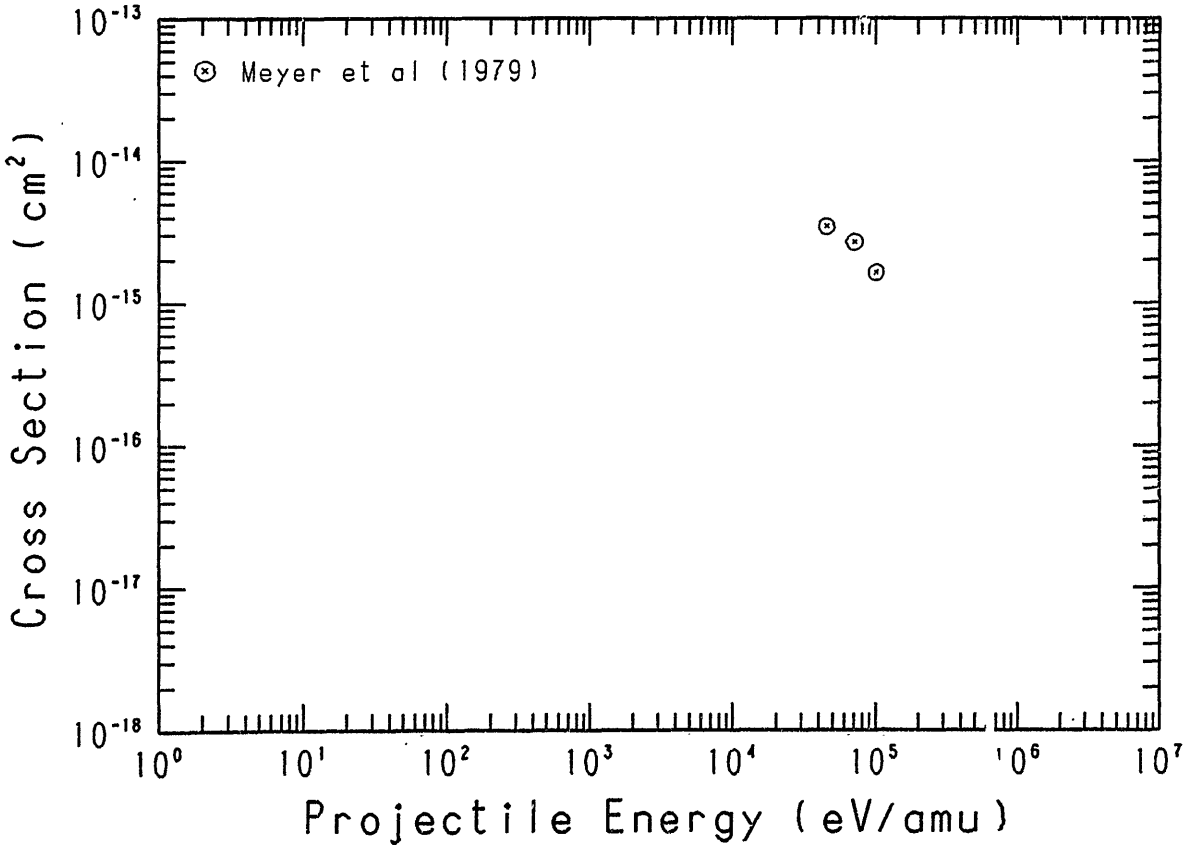


Fig. 163 $Ta^{13+} + H_2 \rightarrow Ta^{12+}$

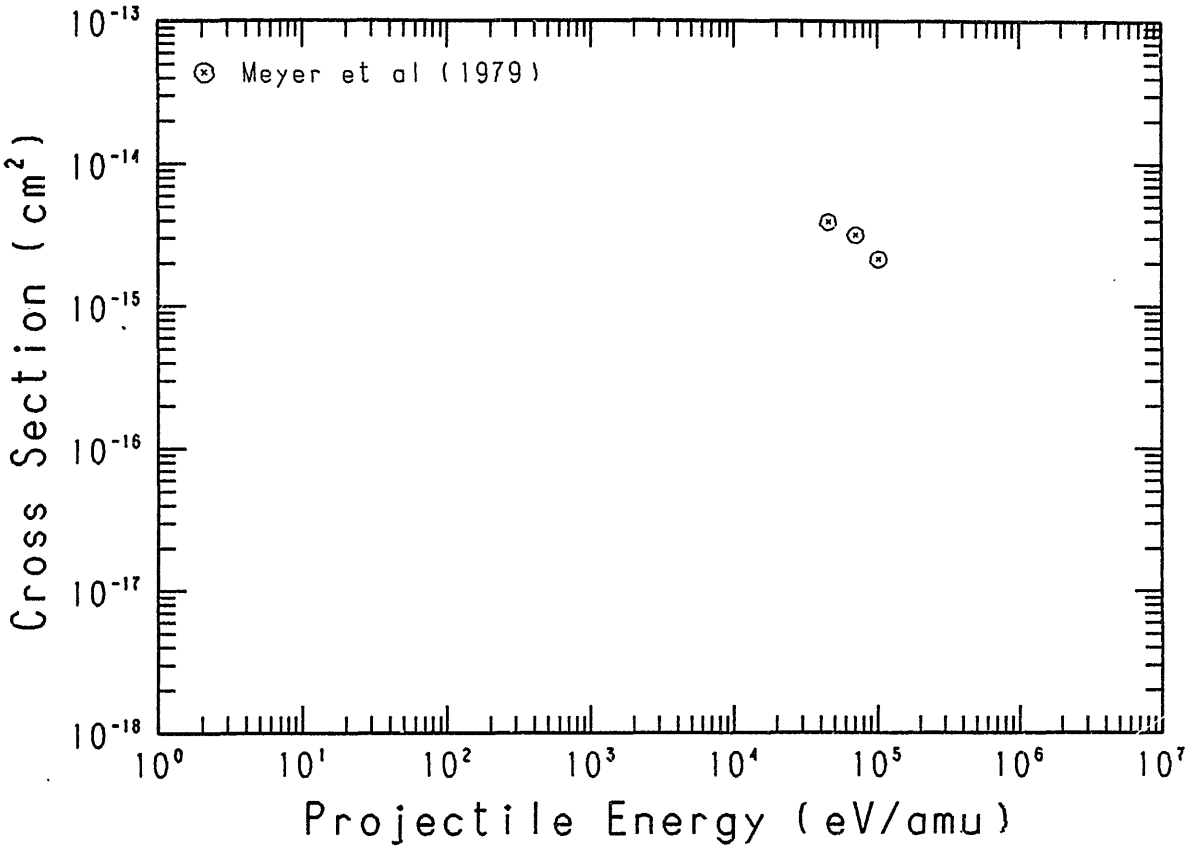


Fig. 164 $Ta^{14+} + H_2 \rightarrow Ta^{13+}$

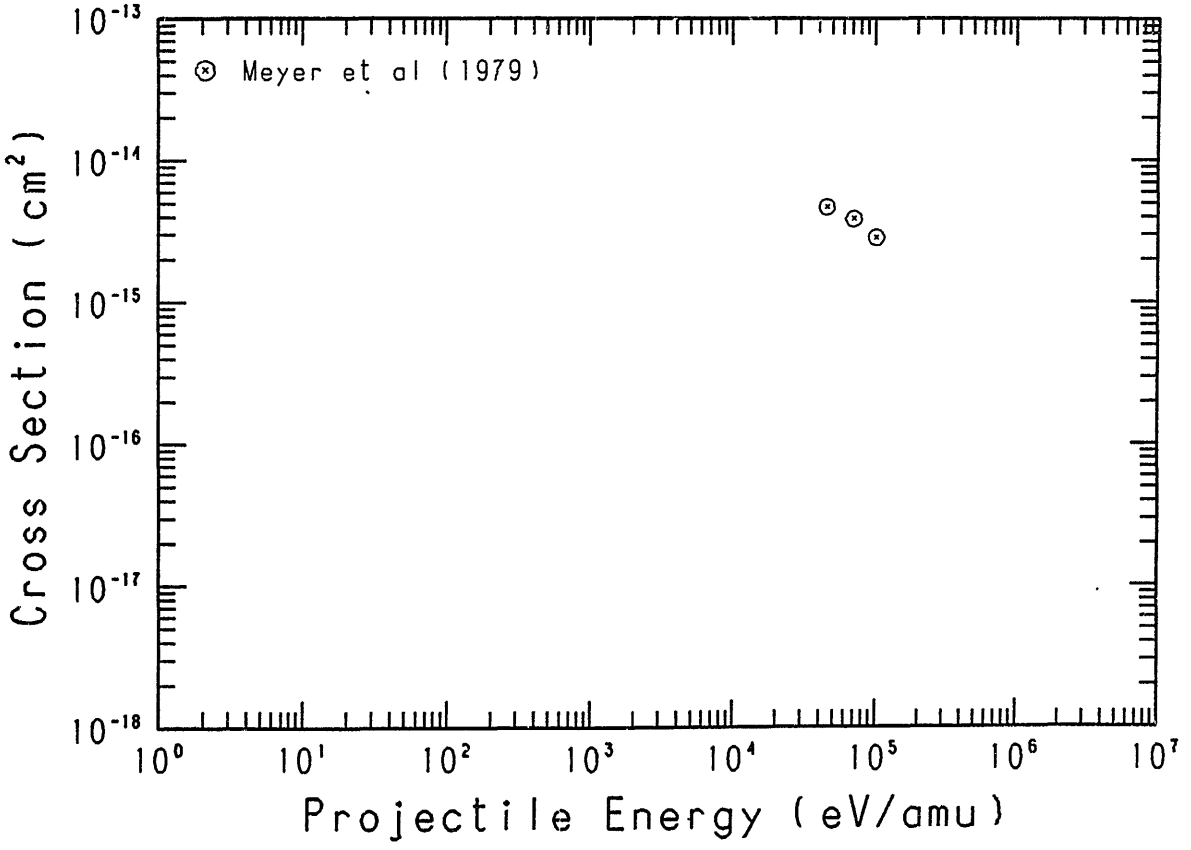


Fig. 165 $Ta^{15+} + H_2 \rightarrow Ta^{14+}$

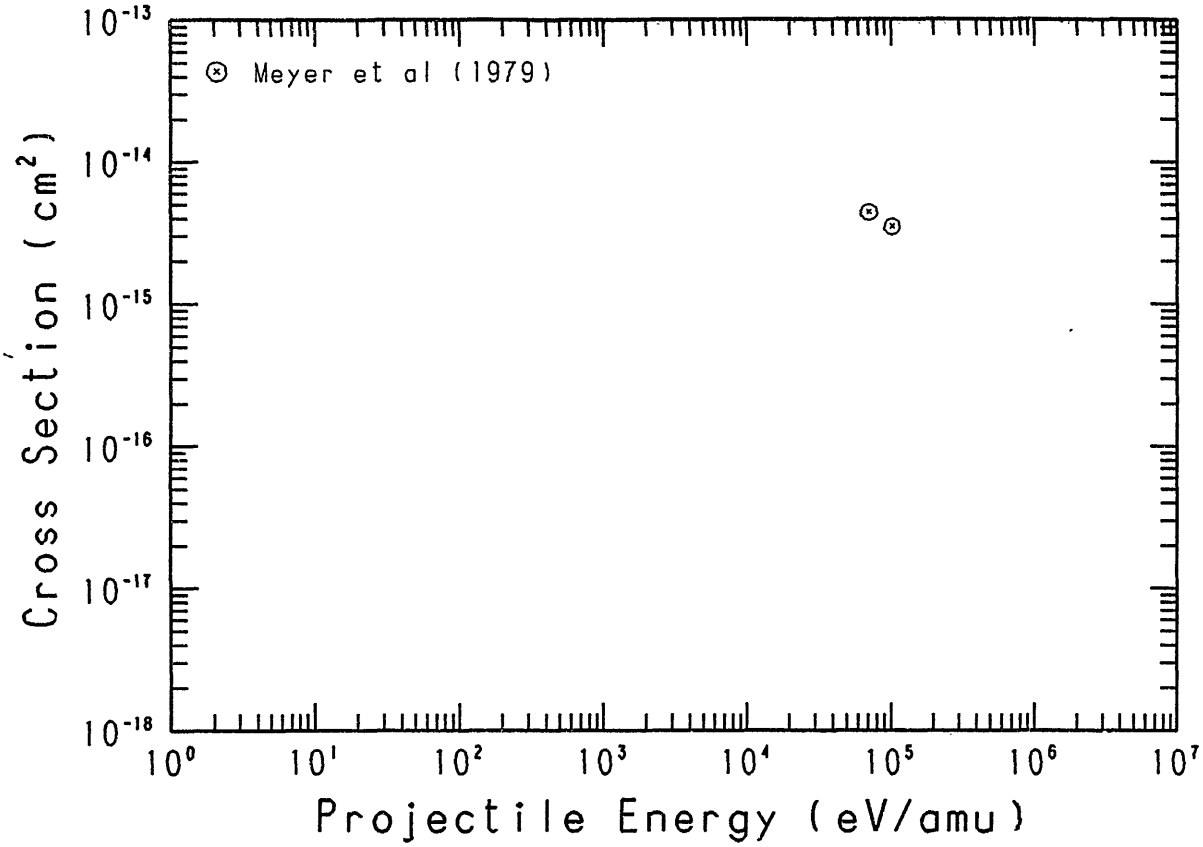


Fig. 166 $Ta^{16+} + H_2 \rightarrow Ta^{15+}$

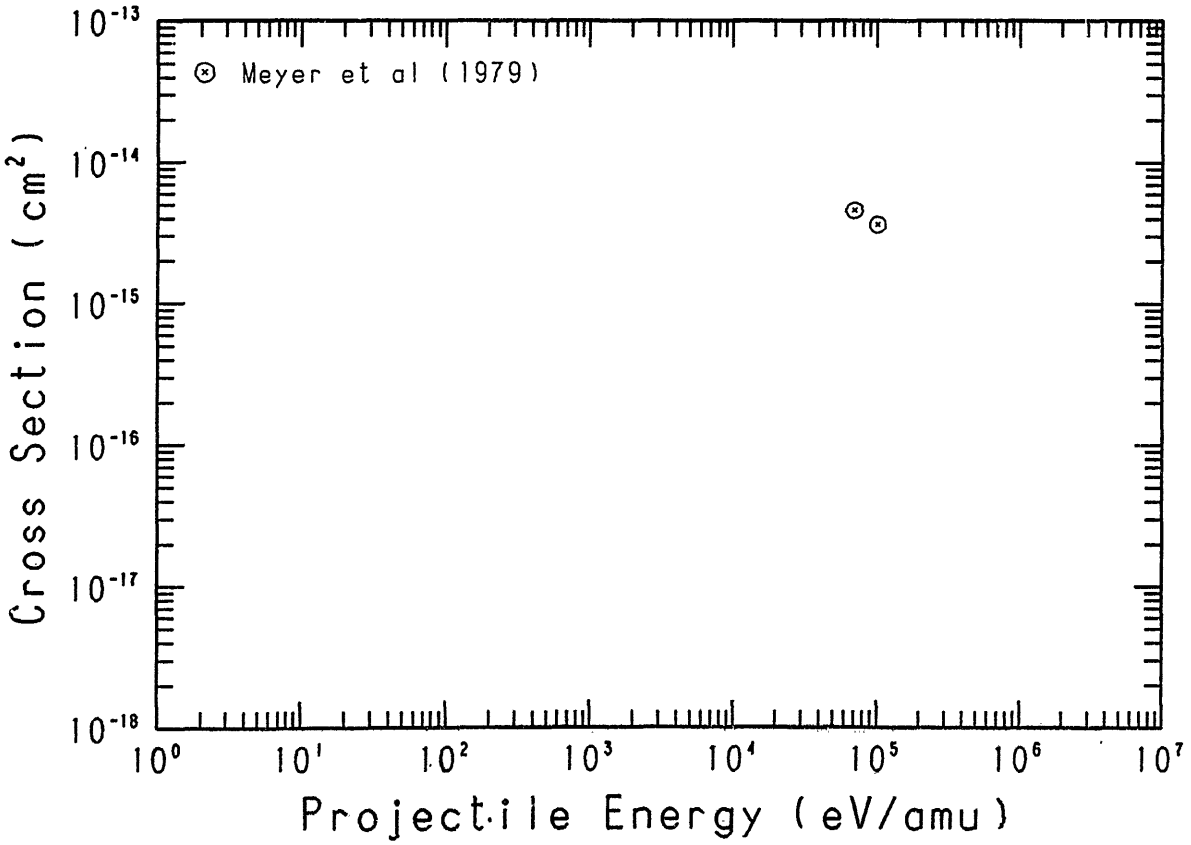


Fig. 167 $Ta^{17+} + H_2 \rightarrow Ta^{16+}$

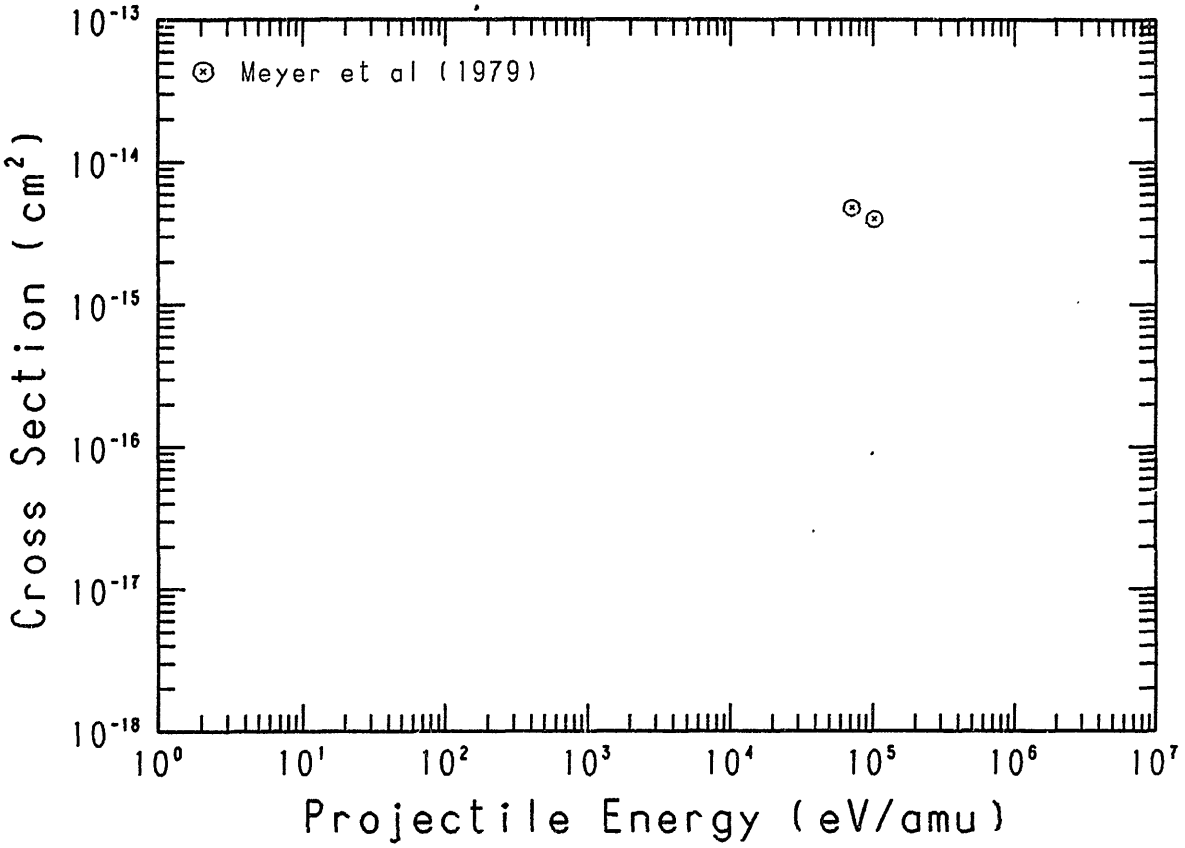


Fig. 168 $Ta^{18+} + H_2 \rightarrow Ta^{17+}$

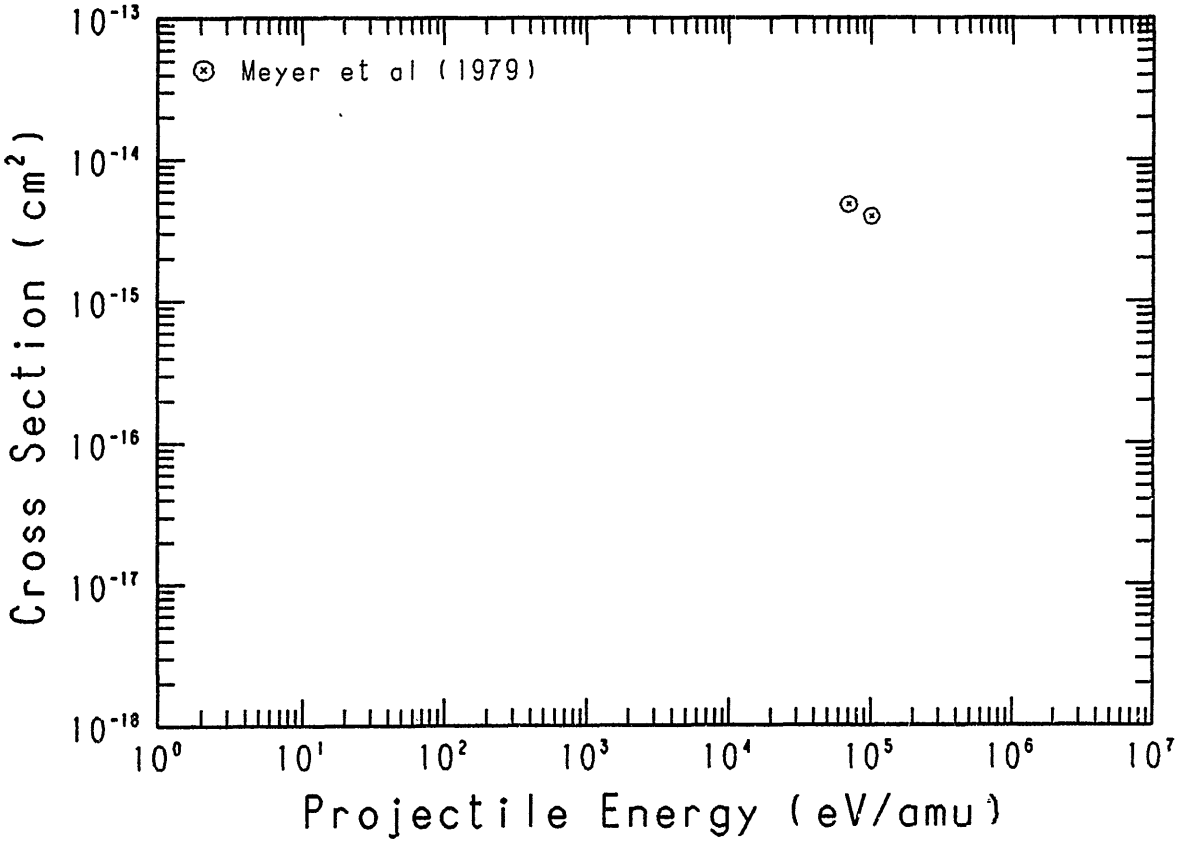


Fig. 169 $Ta^{19+} + H_2 \rightarrow Ta^{18+}$

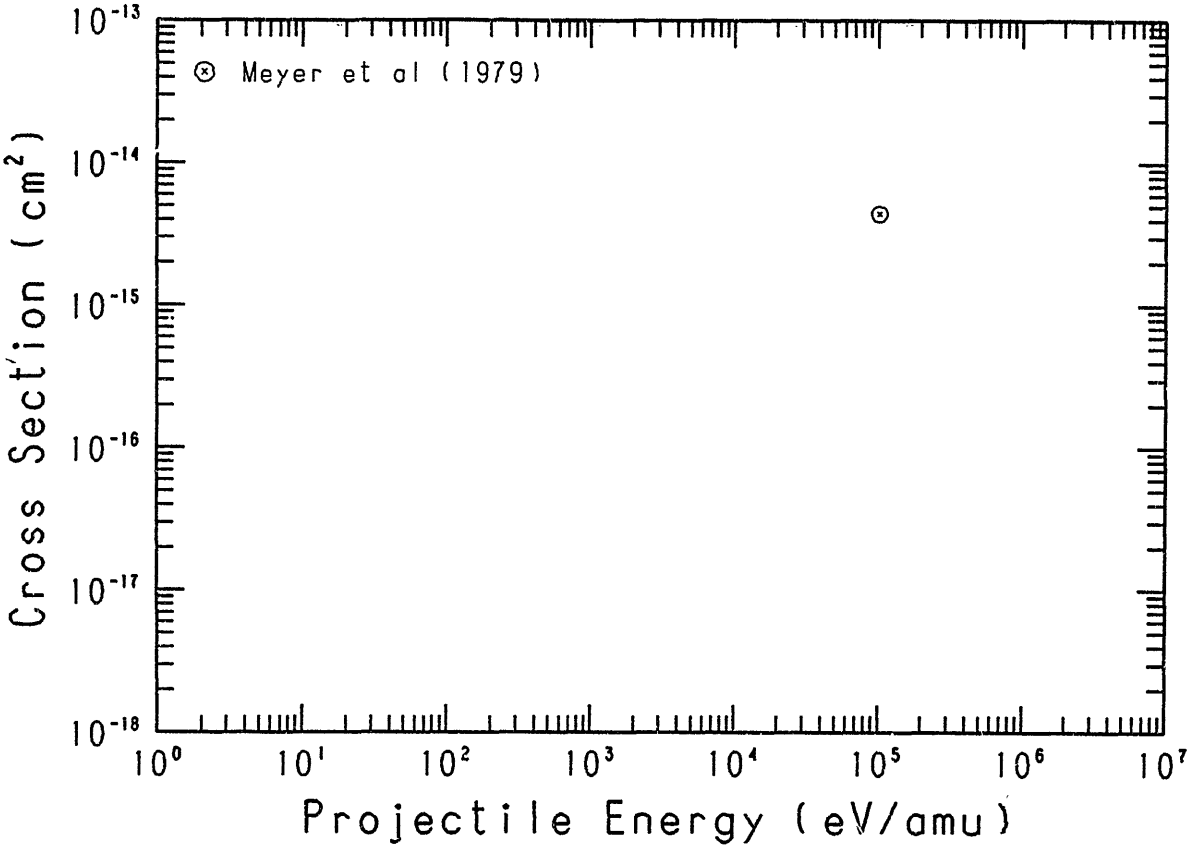


Fig. 170 $W^{4+} + H_2 \rightarrow W^{3+}$

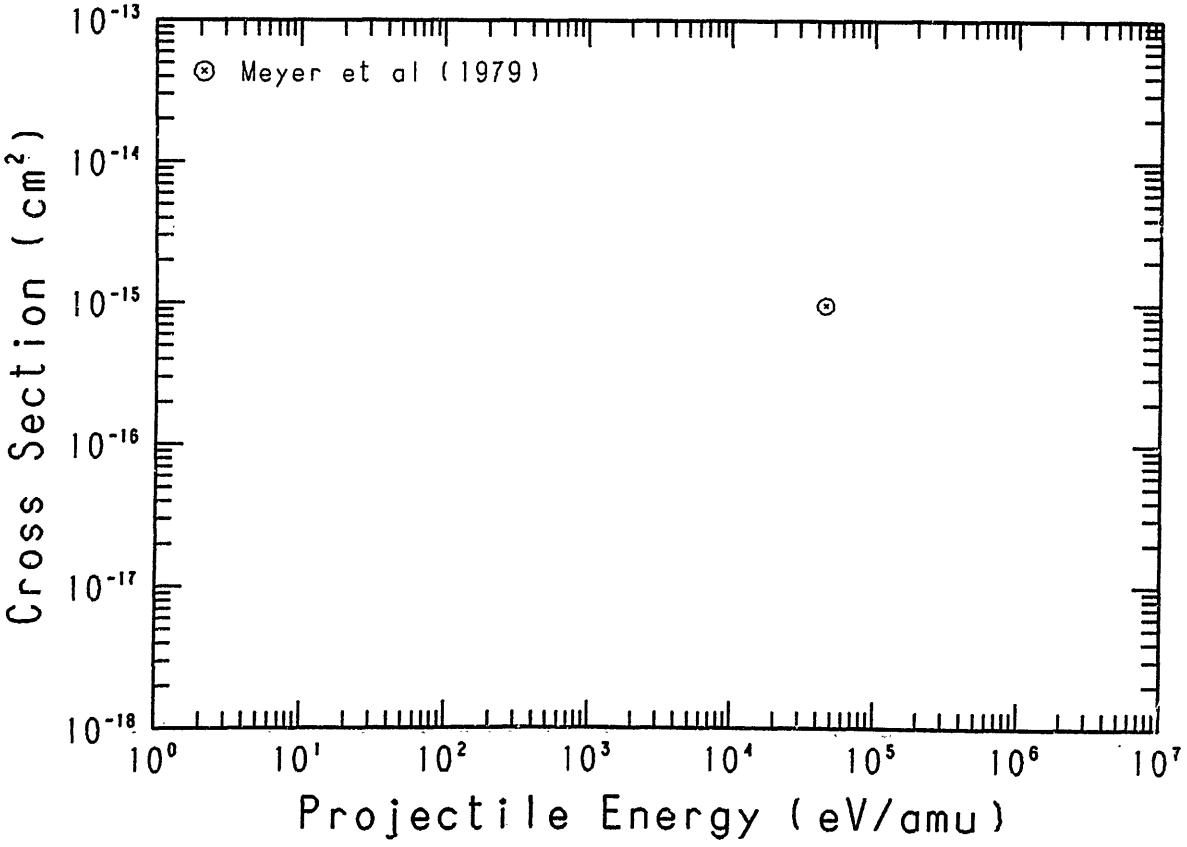


Fig. 171 $W^{5+} + H_2 \rightarrow W^{4+}$

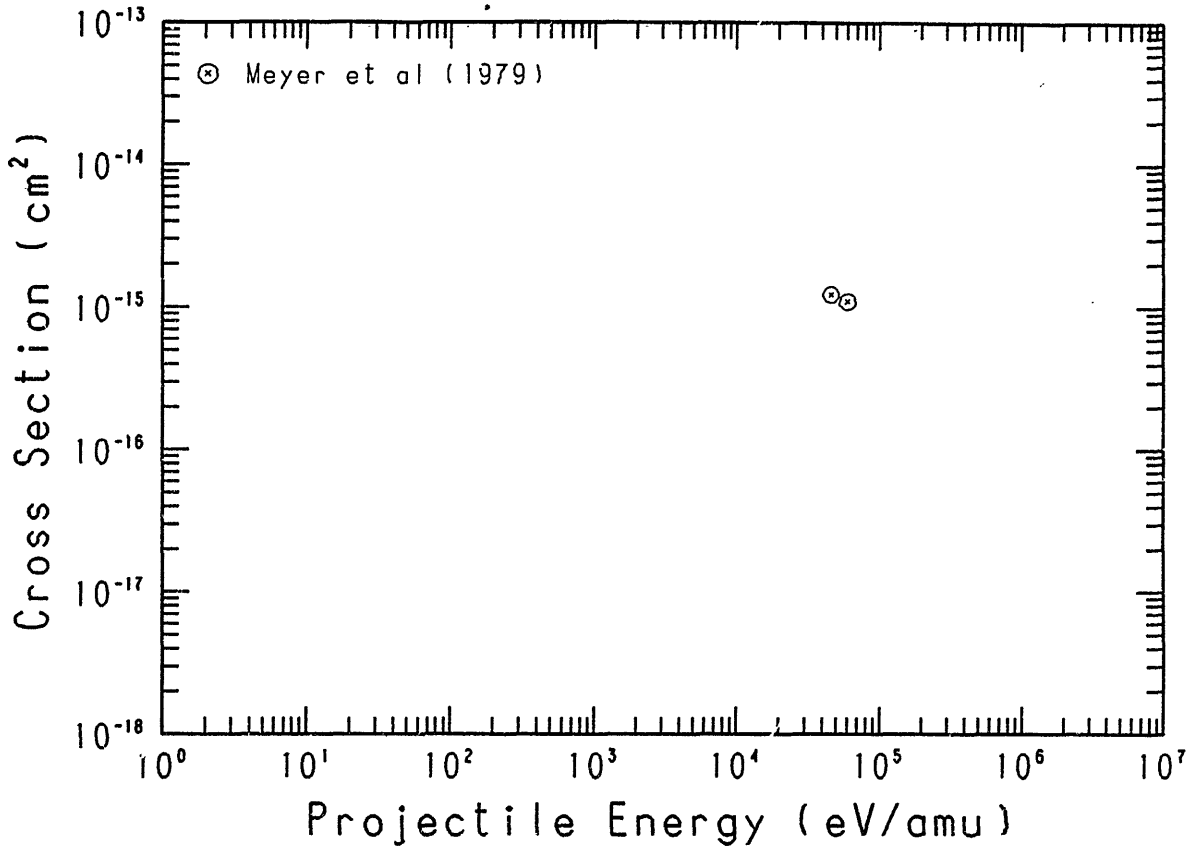


Fig. 172 $W^{6+} + H_2 \rightarrow W^{5+}$

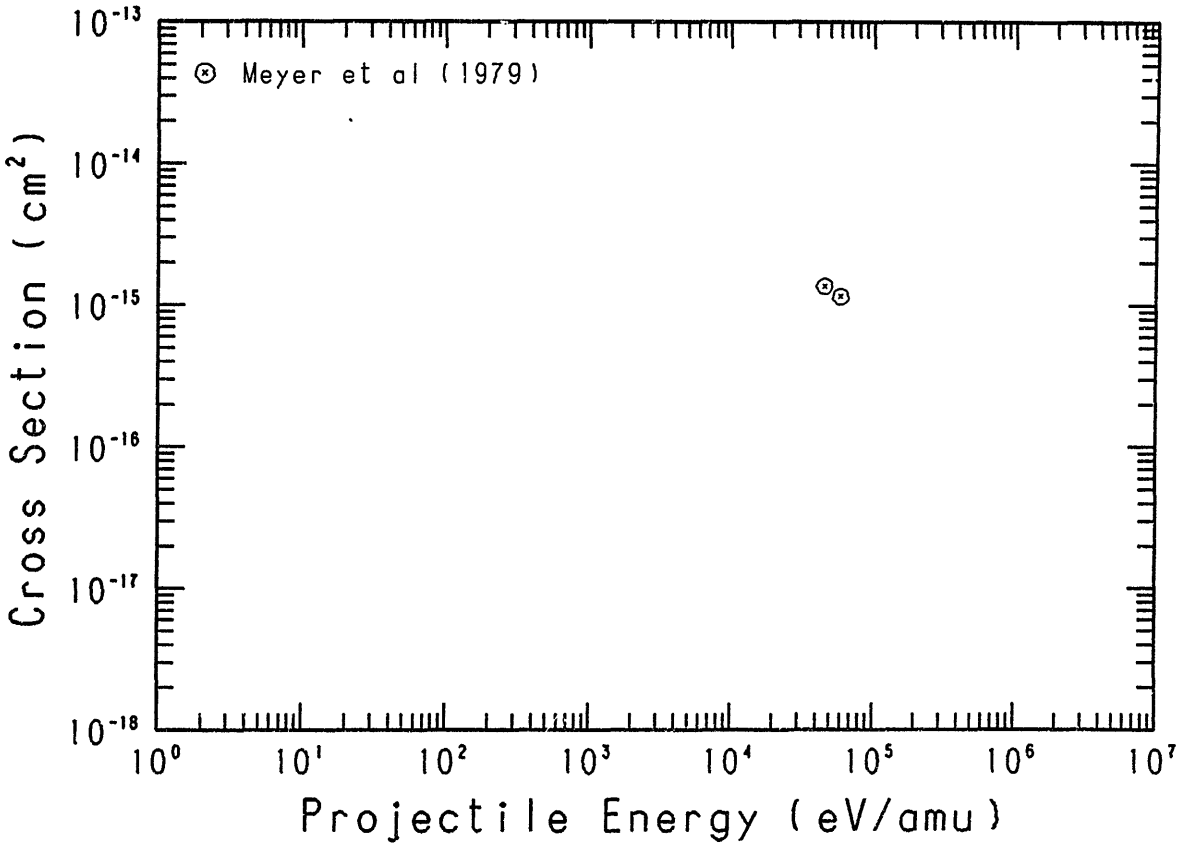


Fig. 173 $W^{7+} + H_2 \rightarrow W^{6+}$

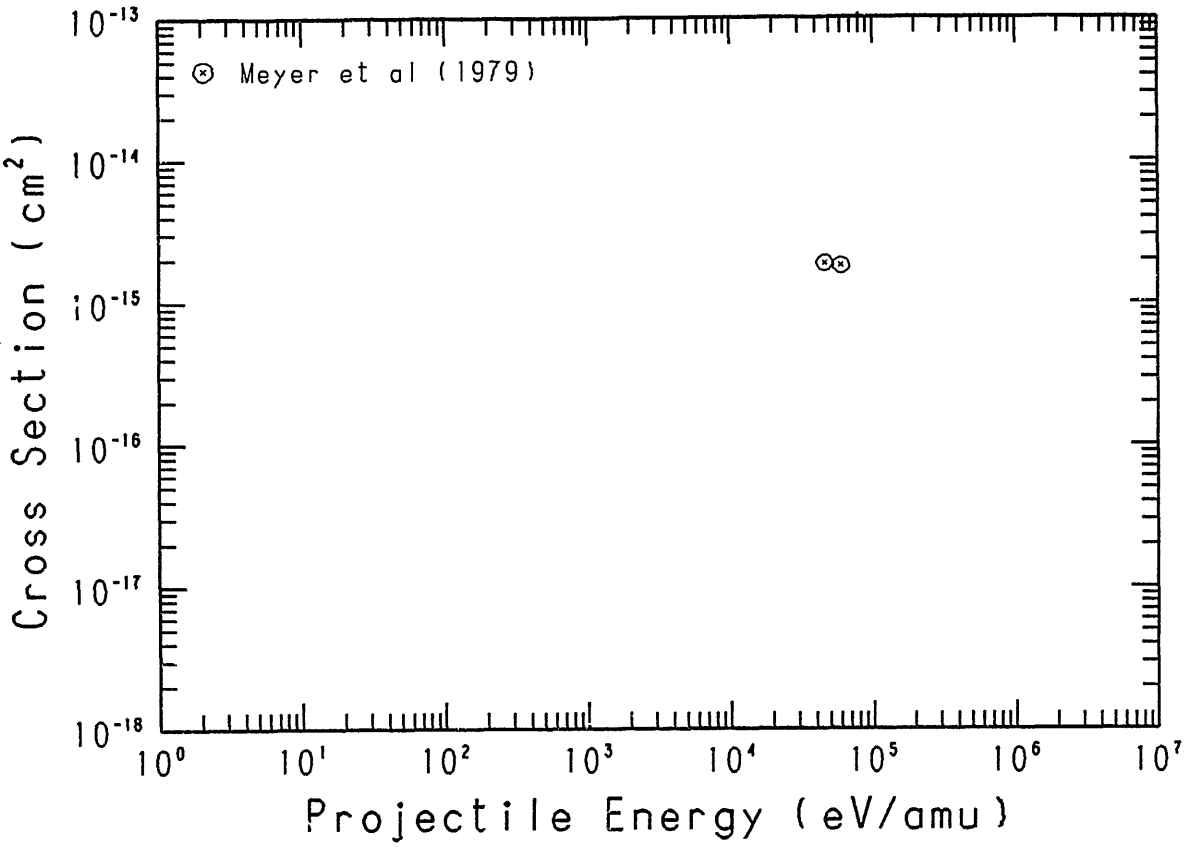


Fig. 174 $W^{8+} + H_2 \rightarrow W^{7+}$

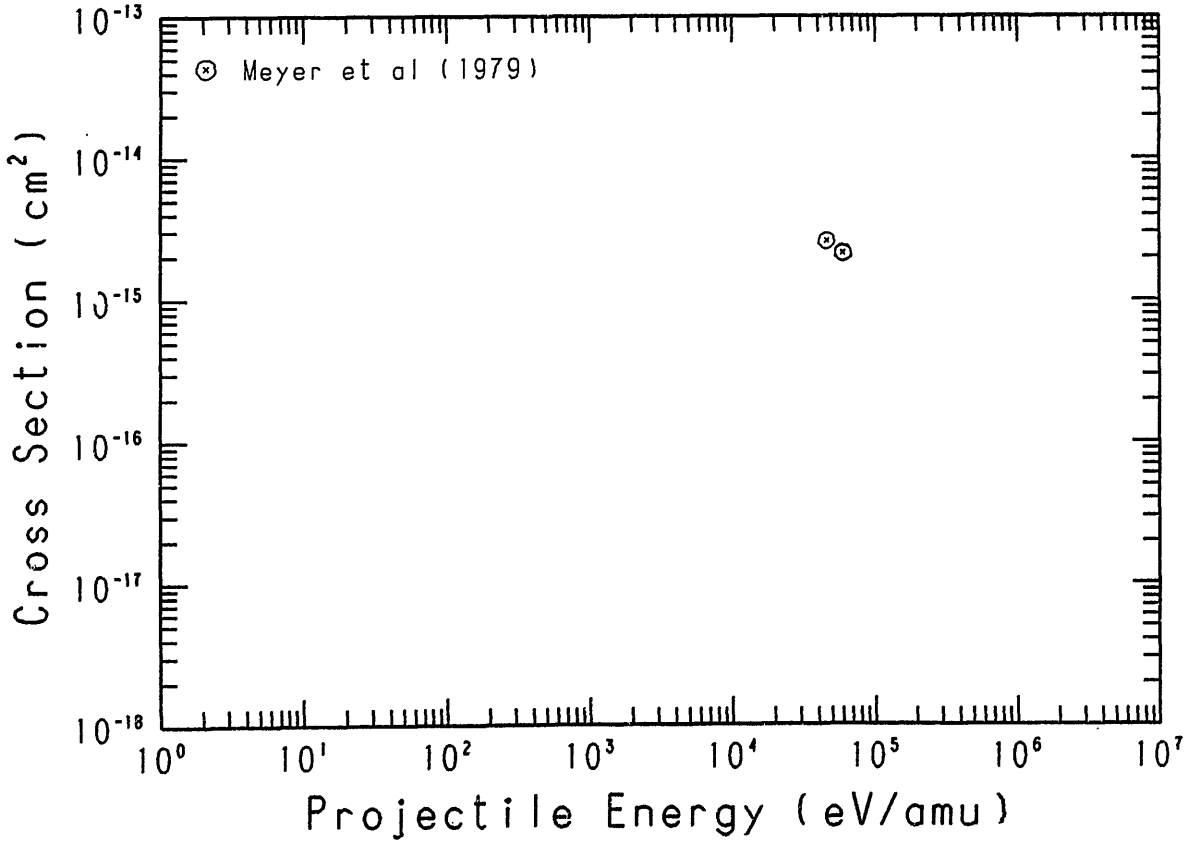


Fig. 175 $W^{9+} + H_2 \rightarrow W^{8+}$

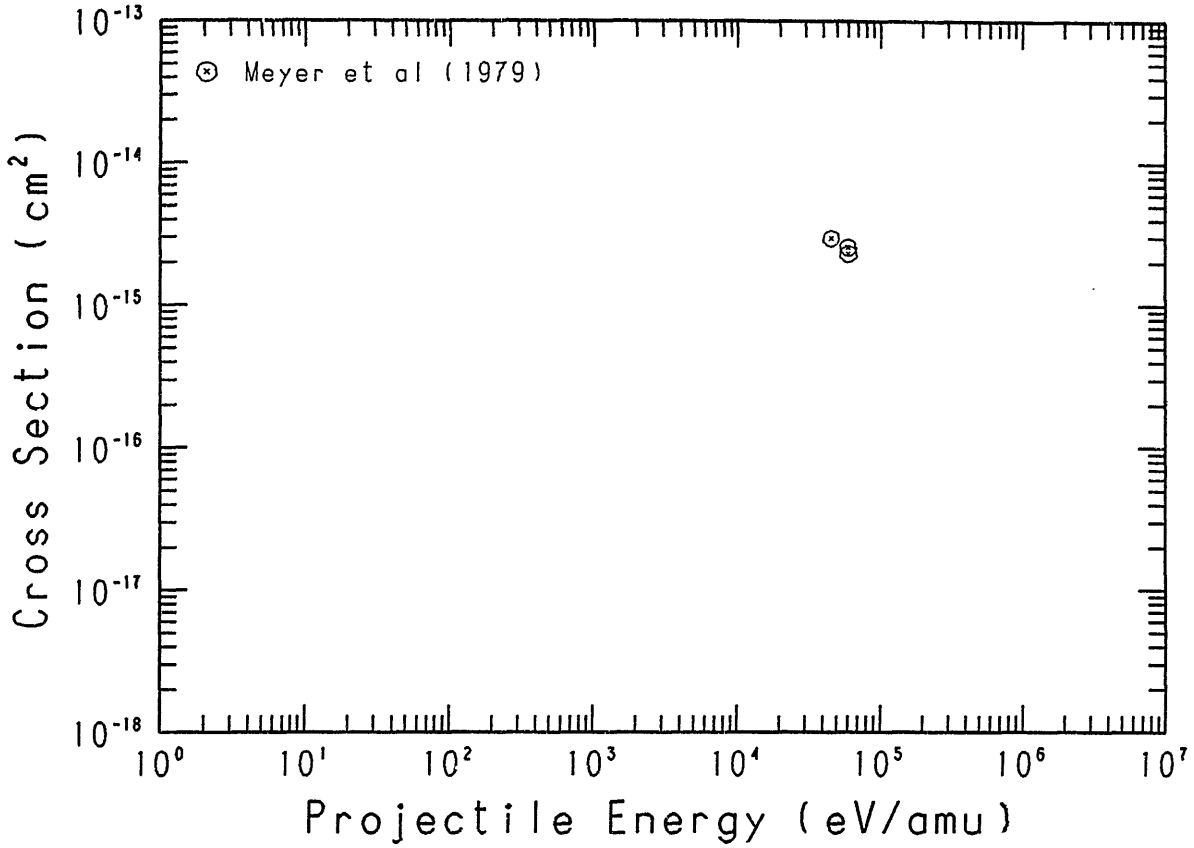


Fig. 176 $W^{10+} + H_2 \rightarrow W^{9+}$

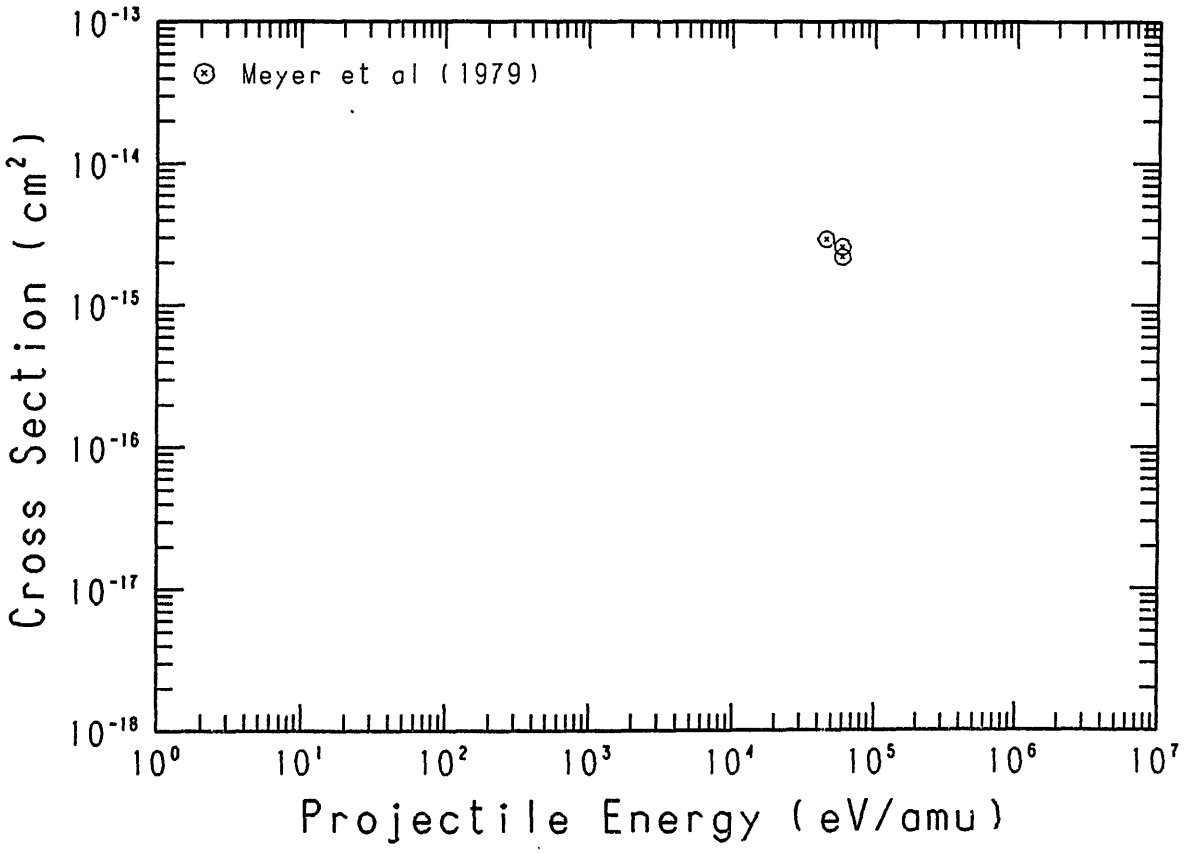


Fig. 177 $W^{11+} + H_2 \rightarrow W^{10+}$

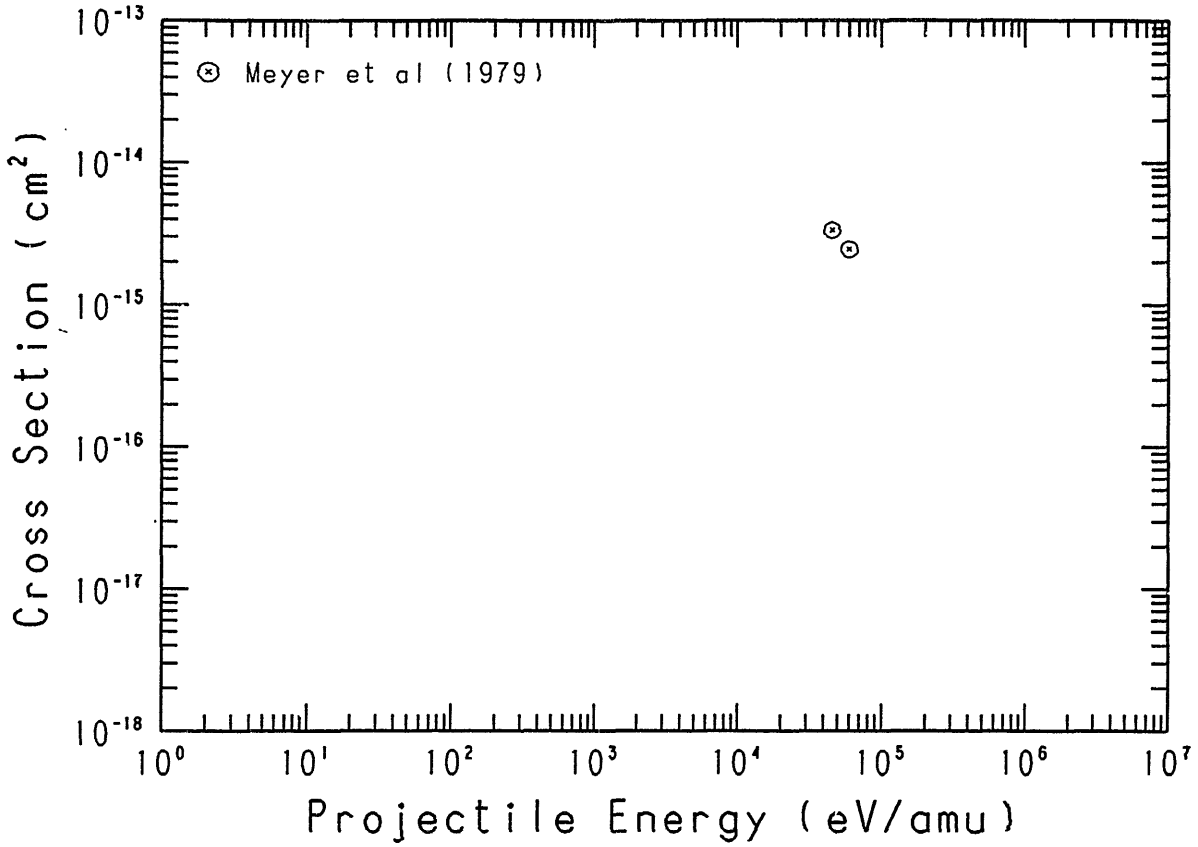


Fig. 178 $W^{12+} + H_2 \rightarrow W^{11+}$

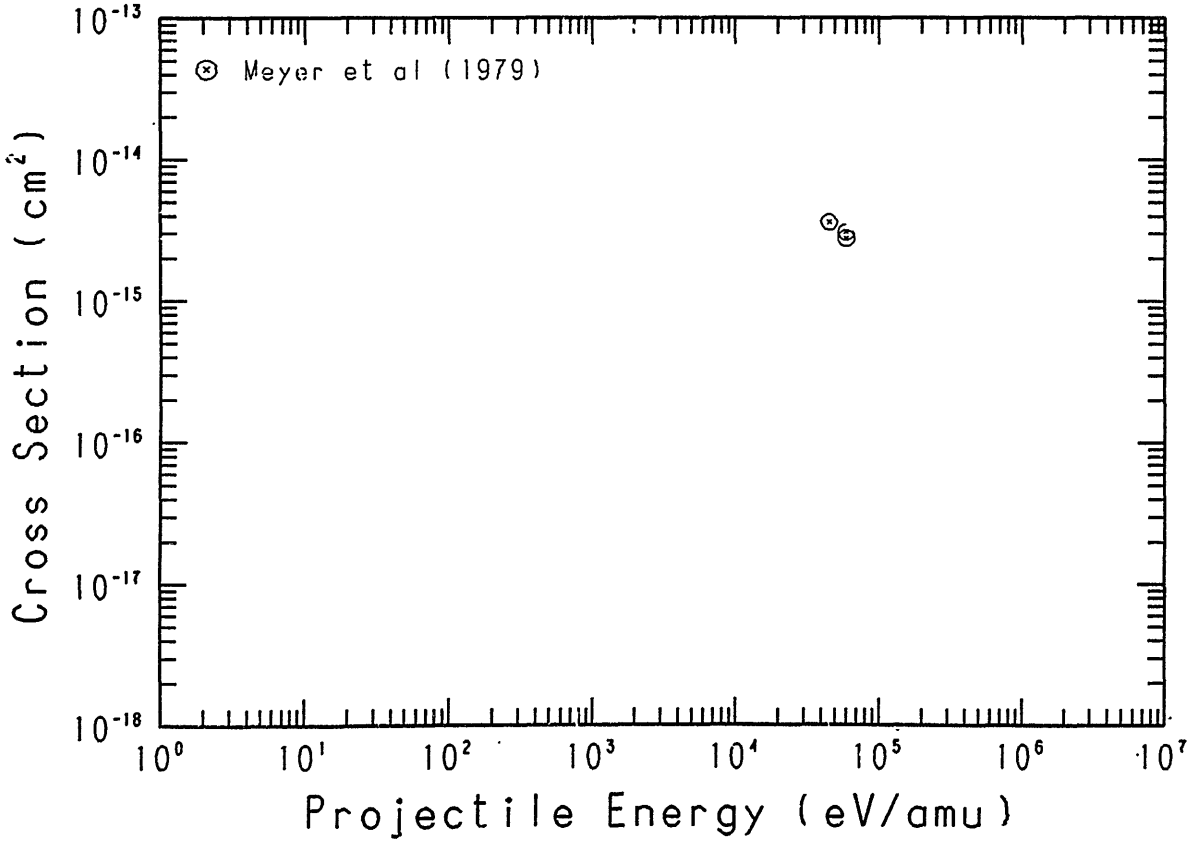


Fig. 179 $W^{13+} + H_2 \rightarrow W^{12+}$

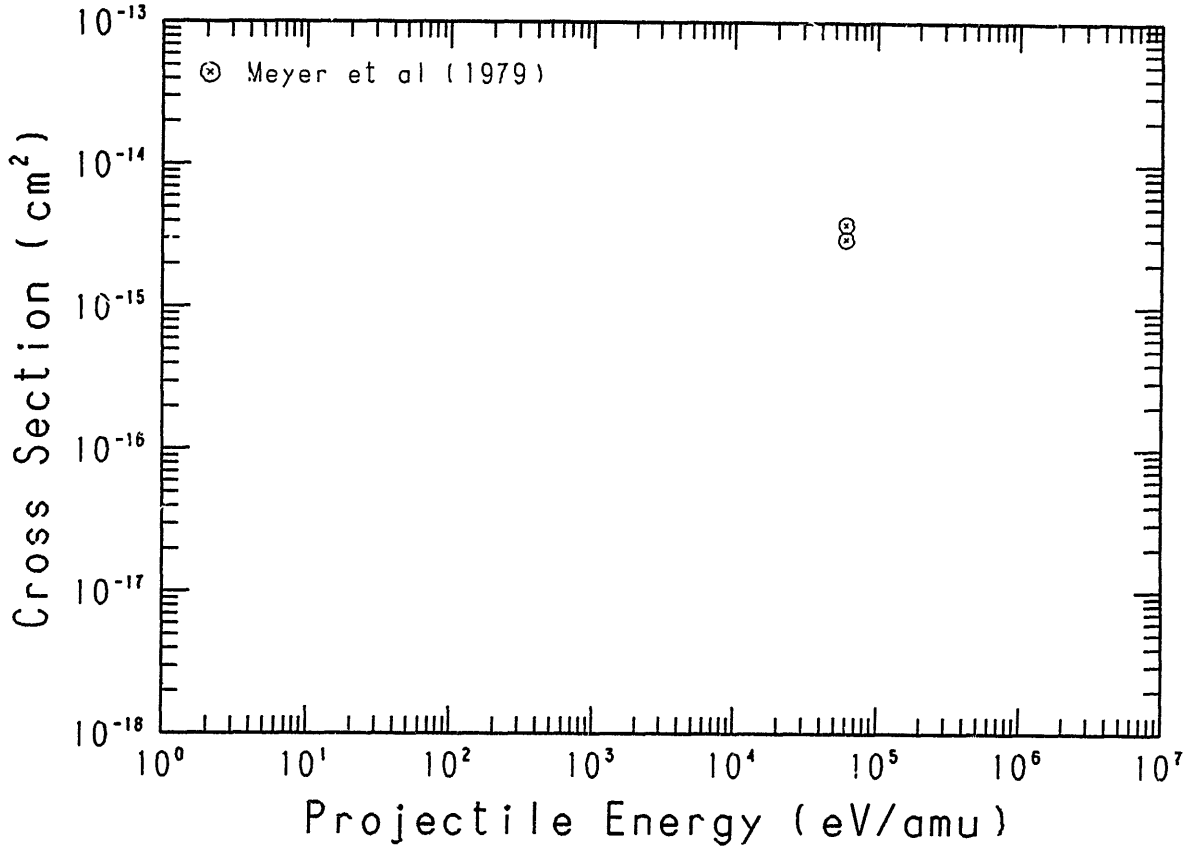


Fig. 180 $W^{14+} + H_2 \rightarrow W^{13+}$

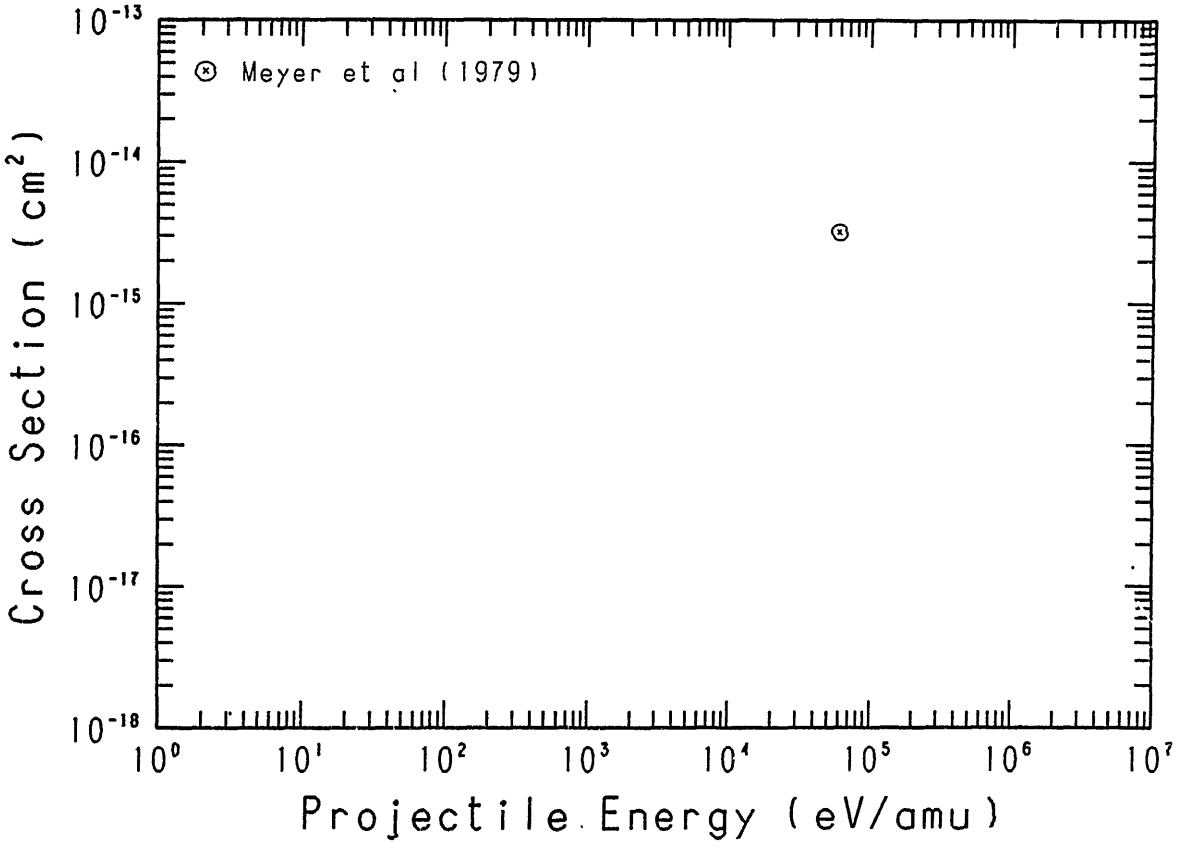


Fig. 181 $W^{15+} + H_2 \rightarrow W^{14+}$

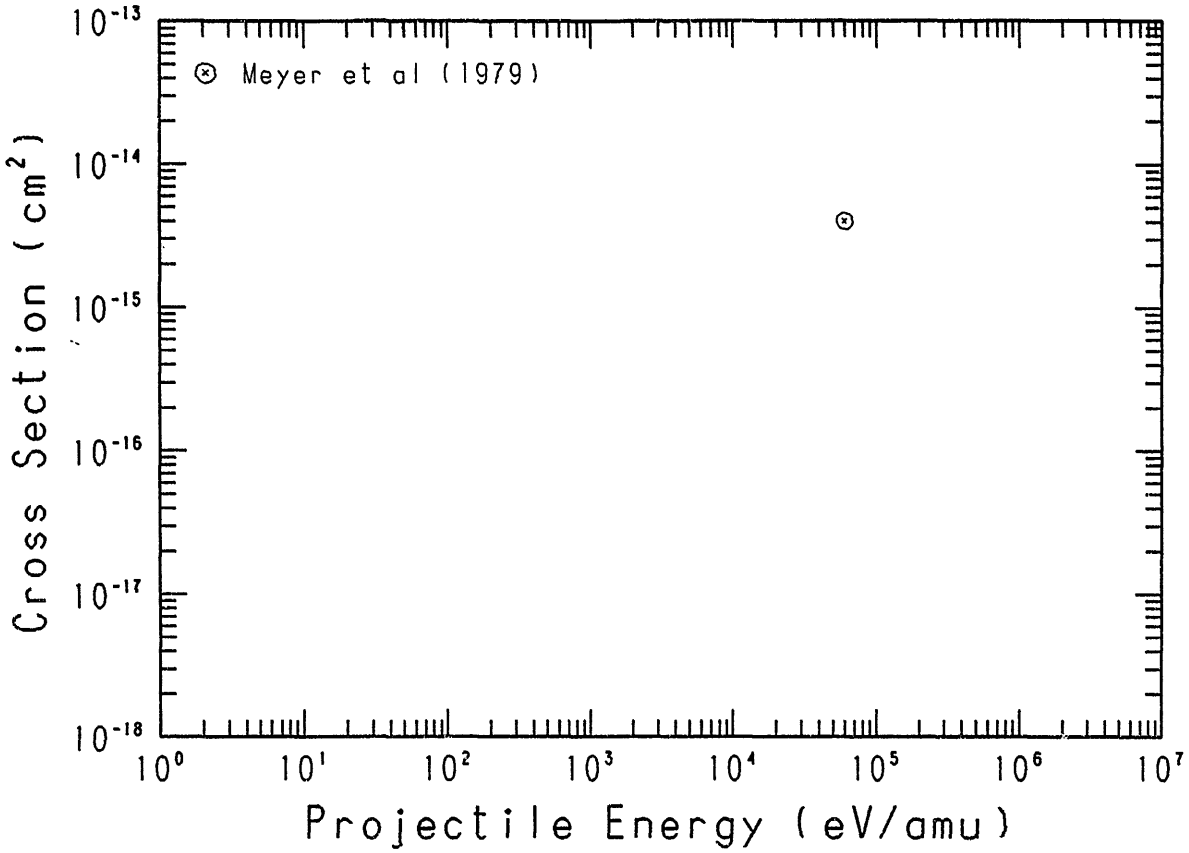


Fig. 182 $Au^{5+} + H_2 \rightarrow Au^{4+}$

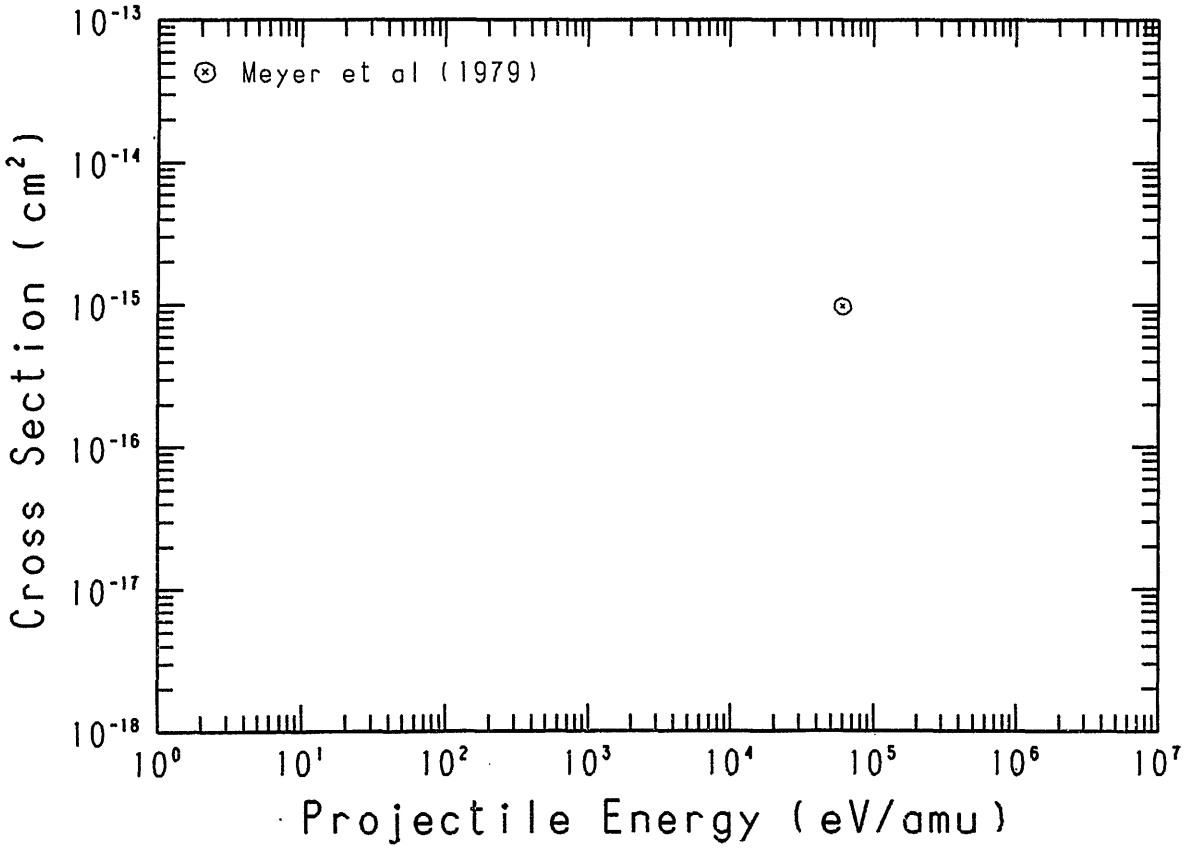


Fig. 183 $Au^{6+} + H_2 \rightarrow Au^{5+}$

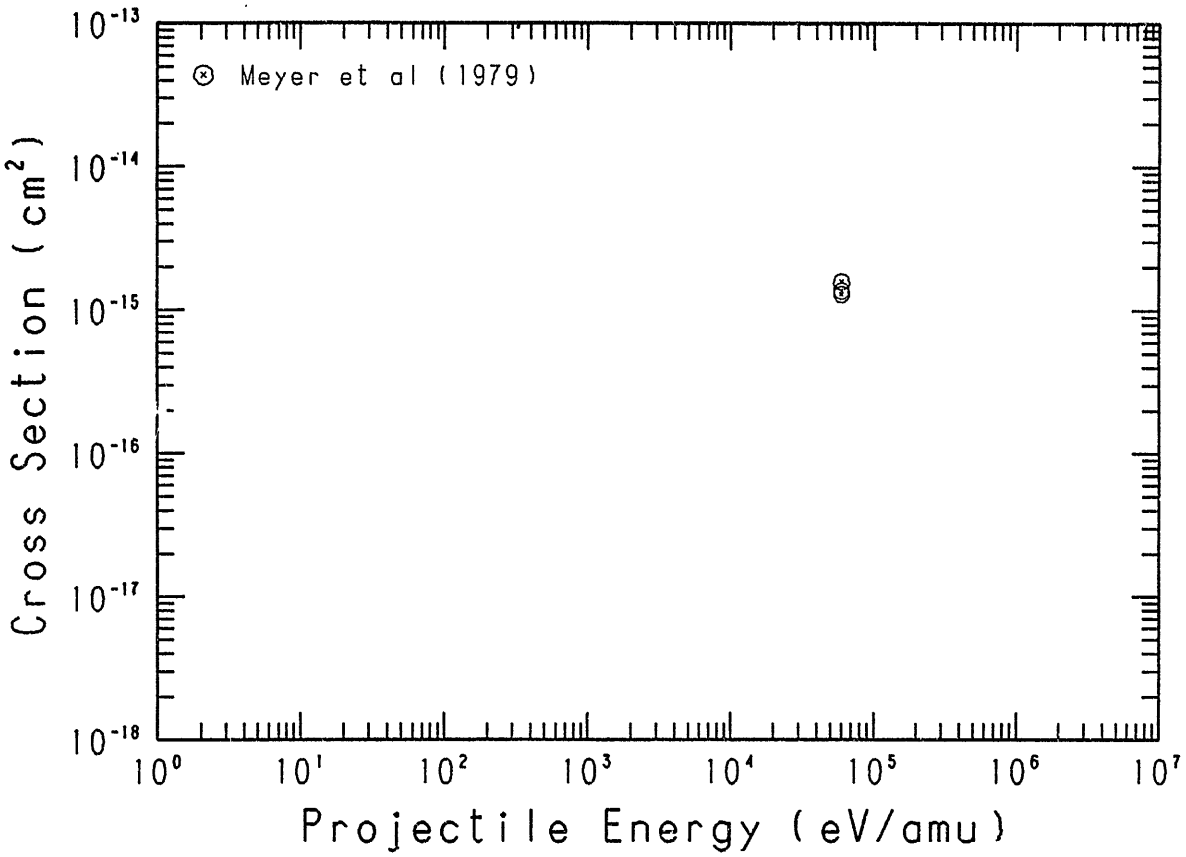


Fig. 184 $Au^{7+} + H_2 \rightarrow Au^{6+}$

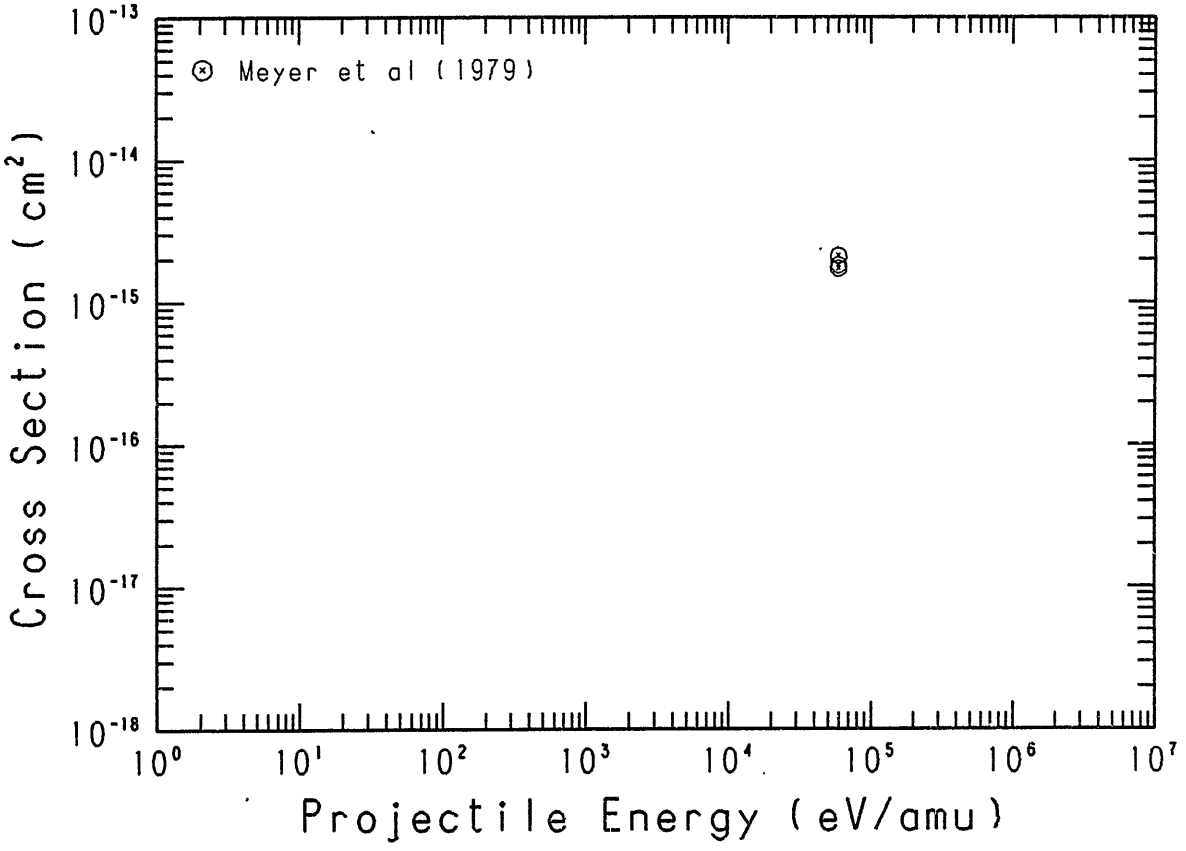


Fig. 185 $Au^{8+} + H_2 \rightarrow Au^{7+}$

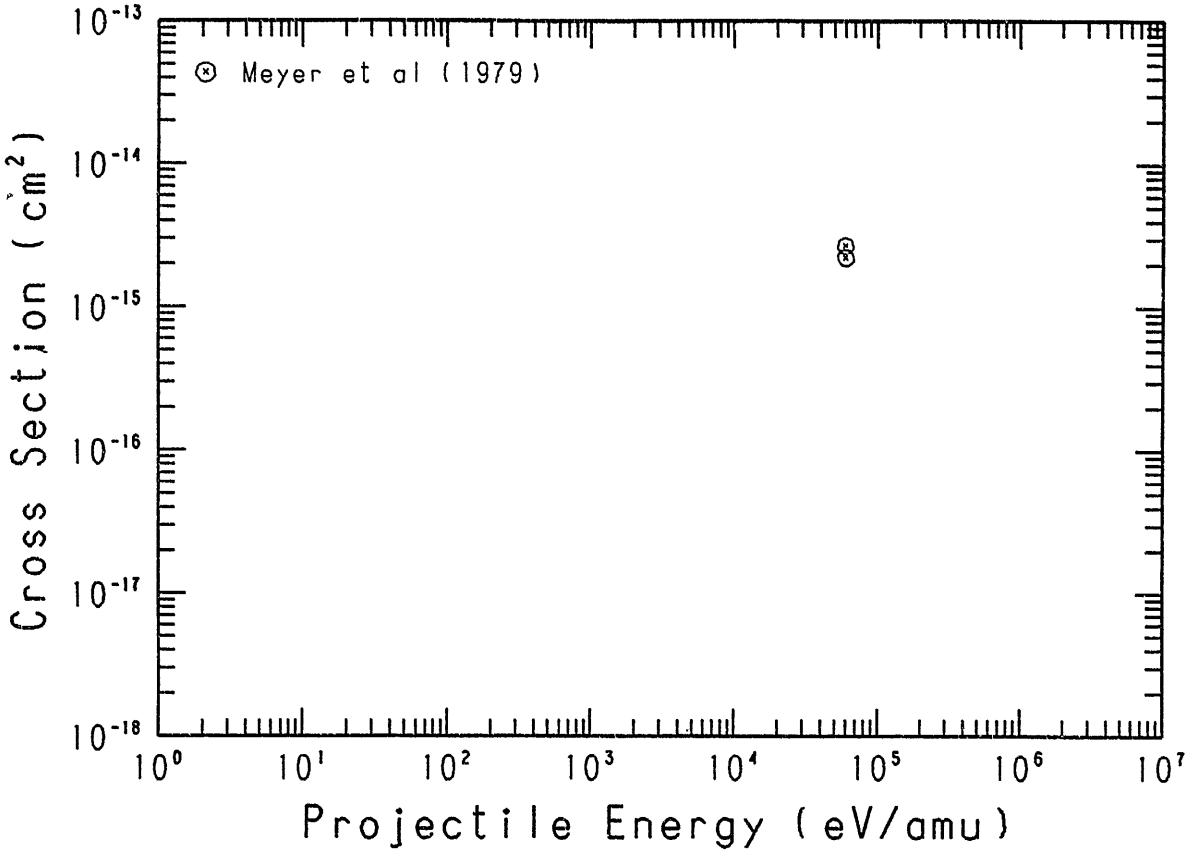


Fig. 186 $Au^{9+} + H_2 \rightarrow Au^{8+}$

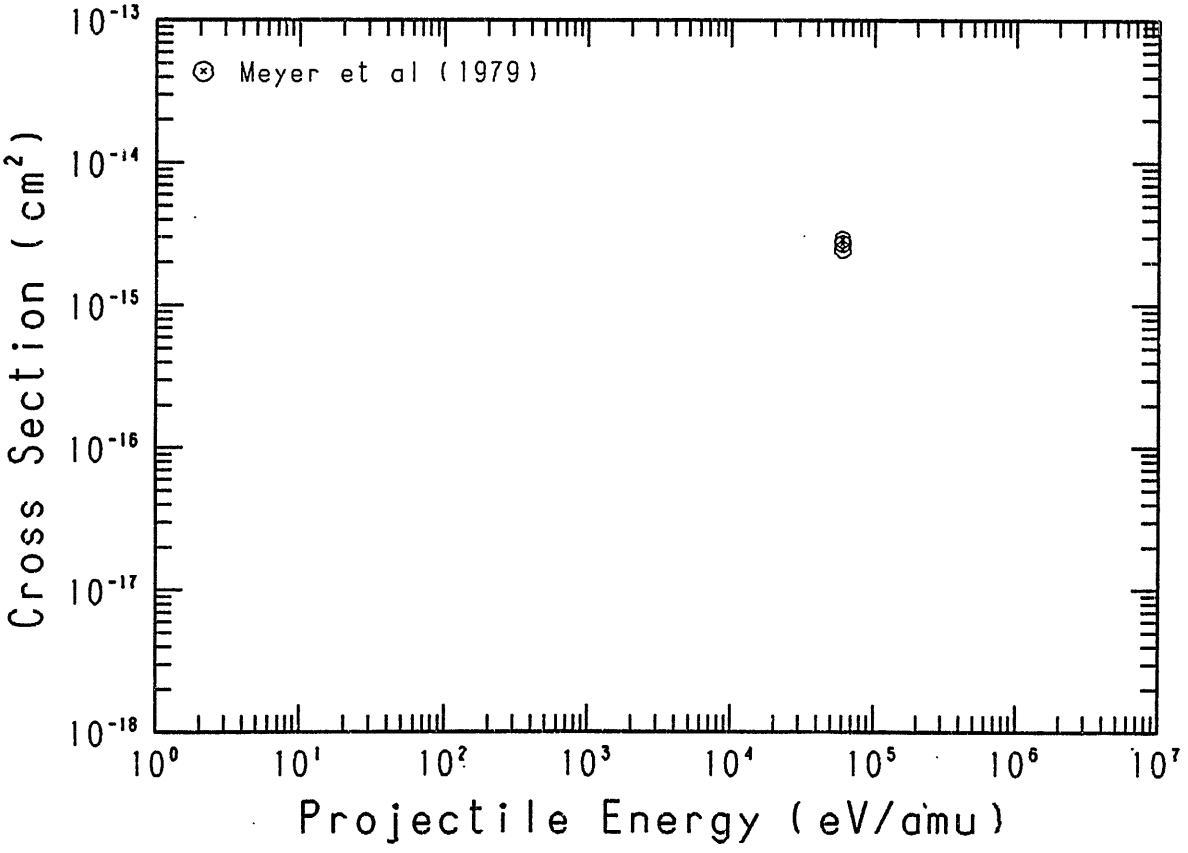


Fig. 187 $Au^{10+} + H_2 \rightarrow Au^{9+}$

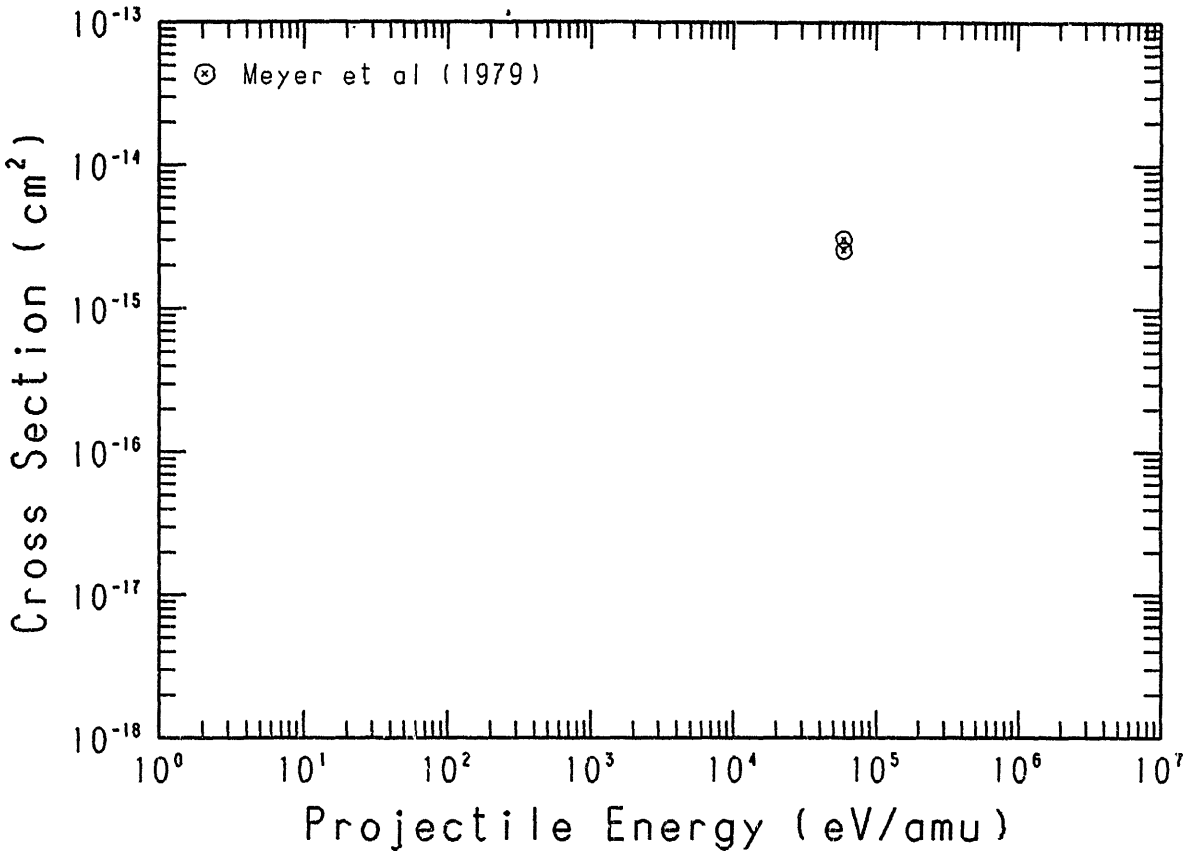


Fig. 188 $Au^{11+} + H_2 \rightarrow Au^{10+}$

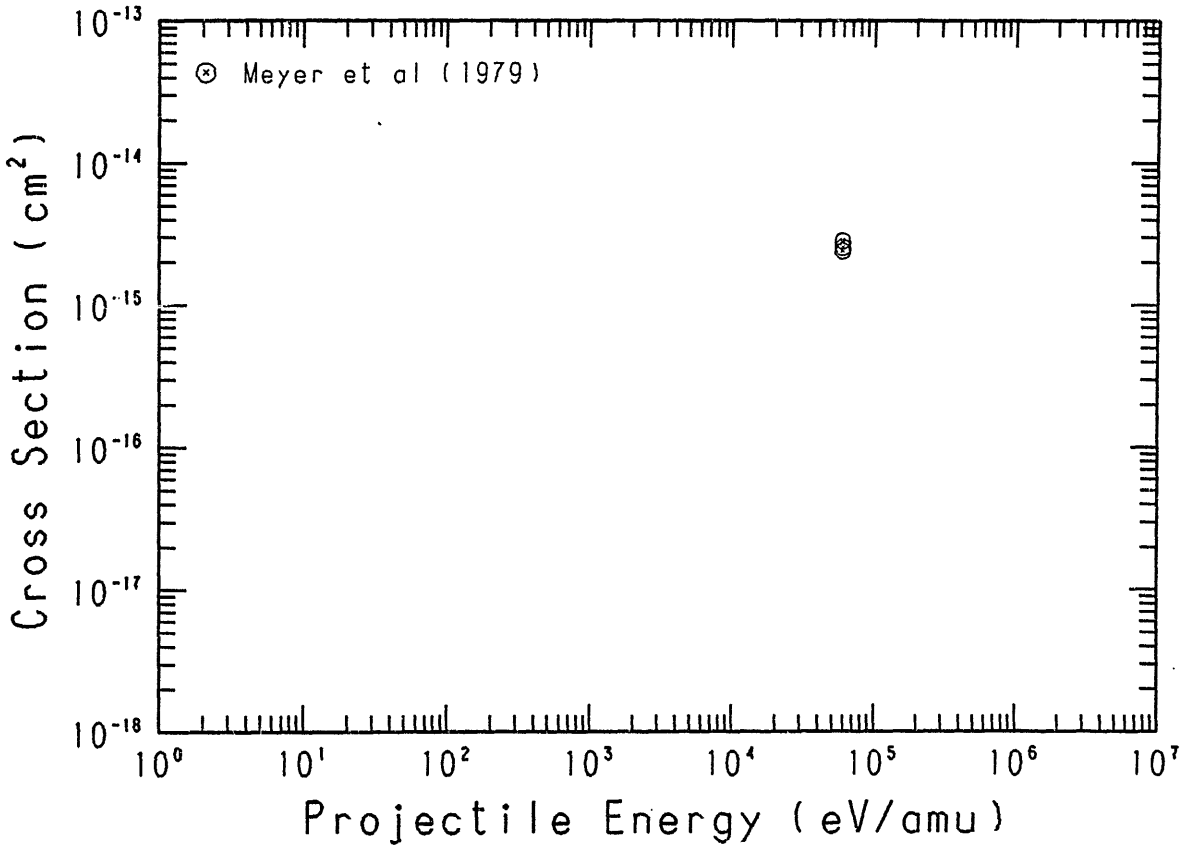


Fig. 189 $Au^{12+} + H_2 \rightarrow Au^{11+}$

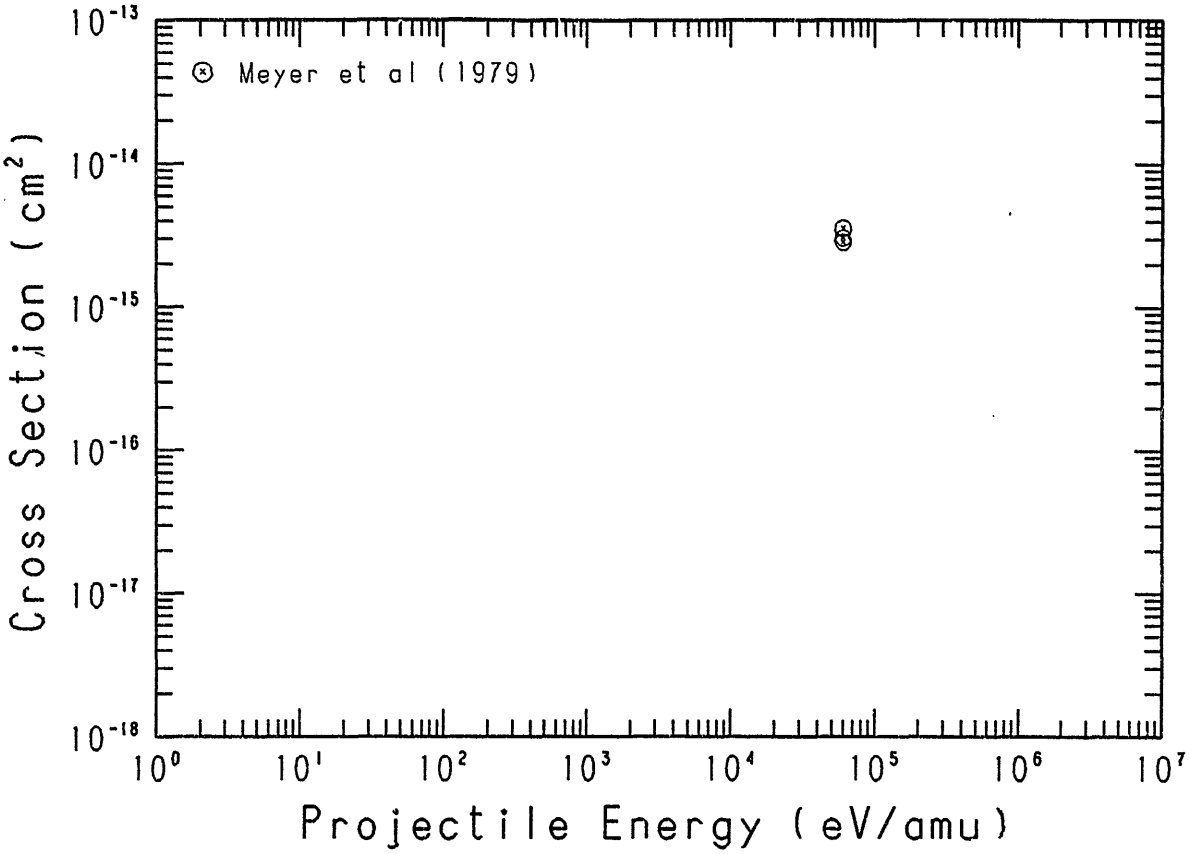


Fig. 190 $Au^{13+} + H_2 \rightarrow Au^{12+}$

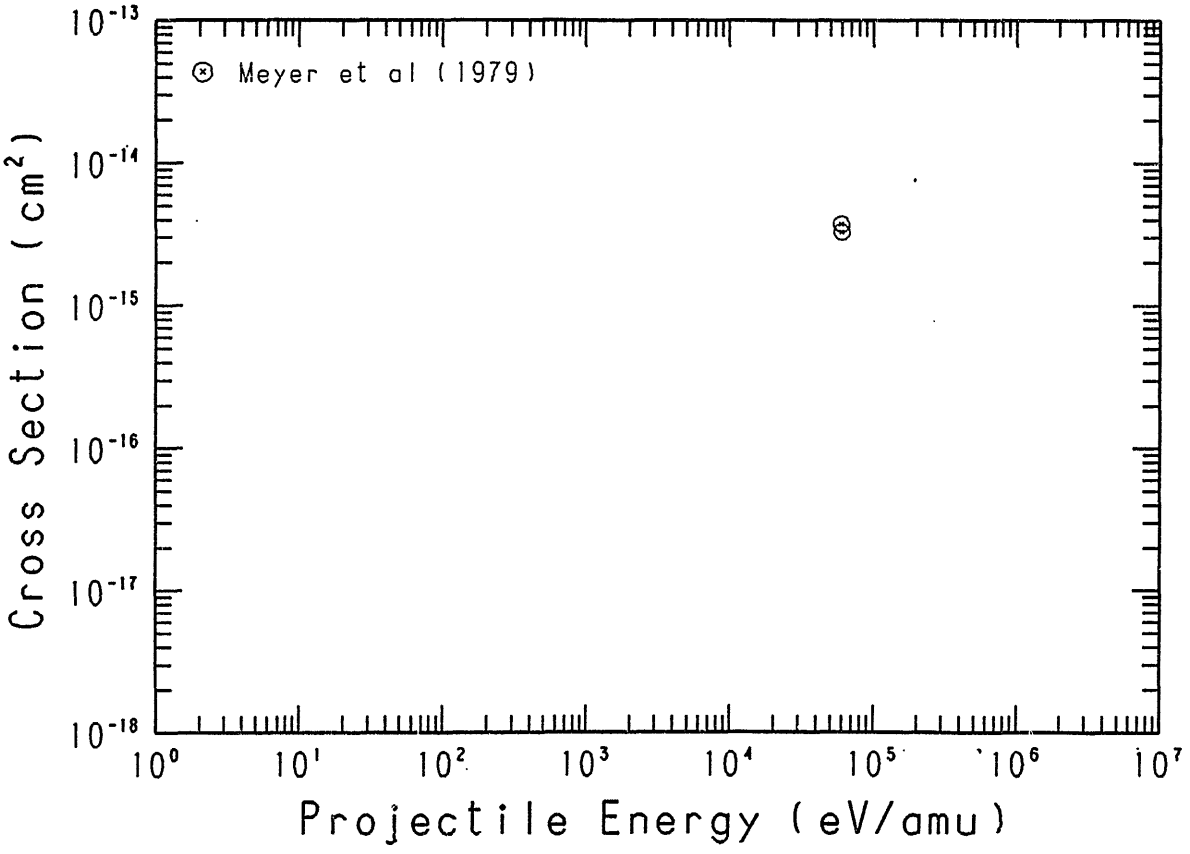


Fig. 191 $Au^{14+} + H_2 \rightarrow Au^{13+}$

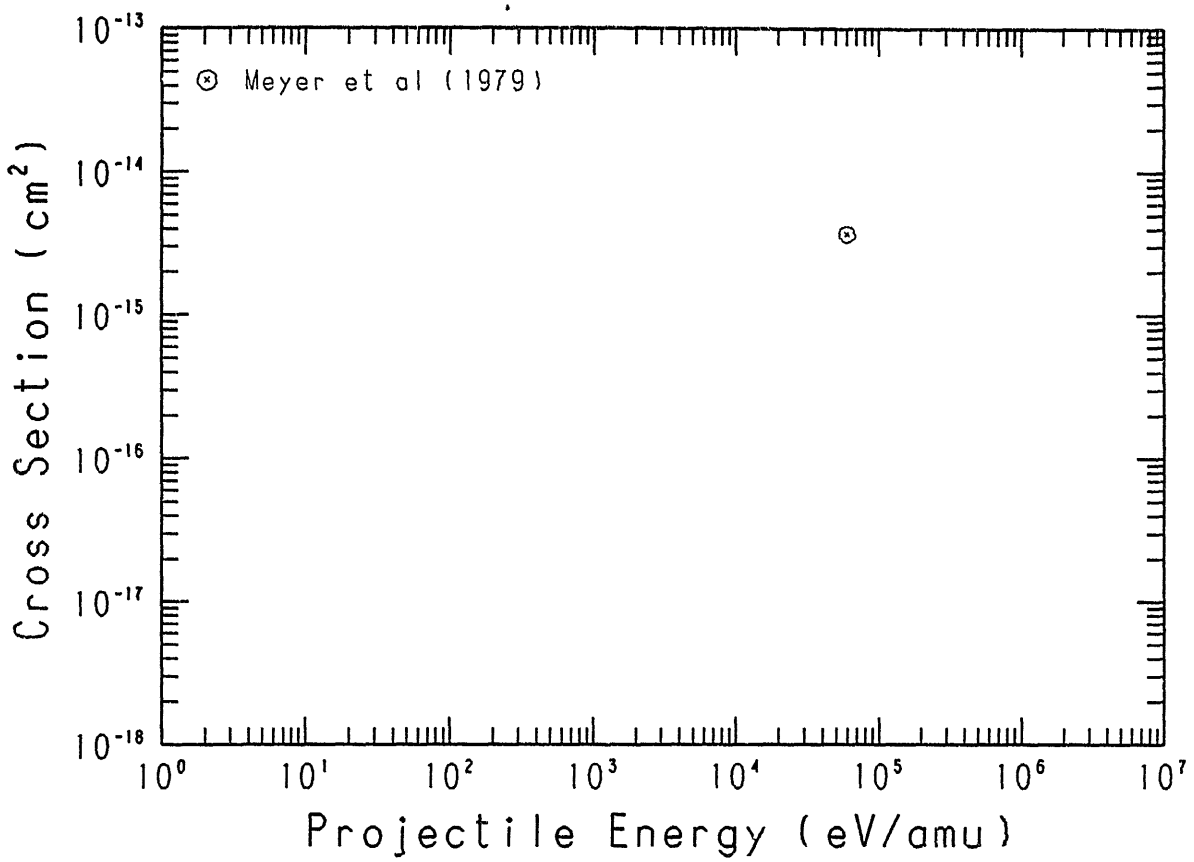


Fig. 192 $Au^{15+} + H_2 \rightarrow Au^{14+}$

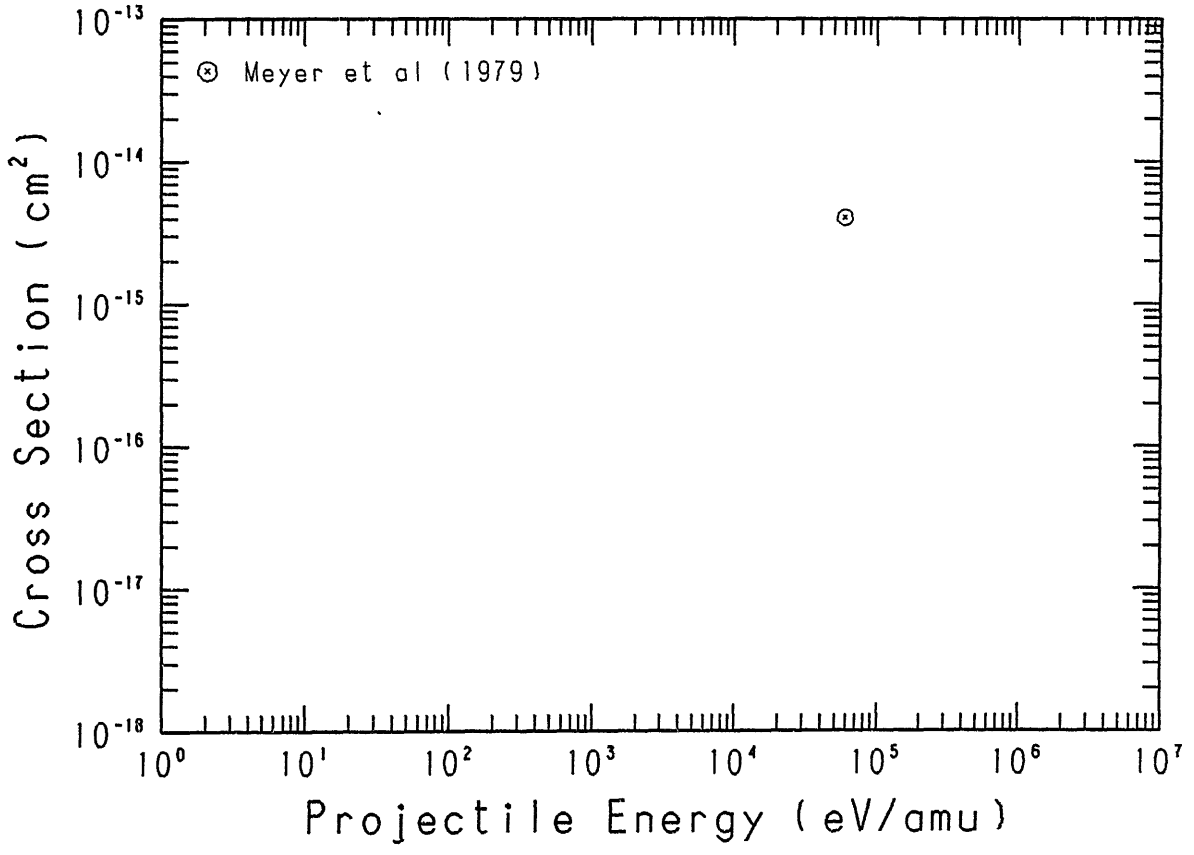
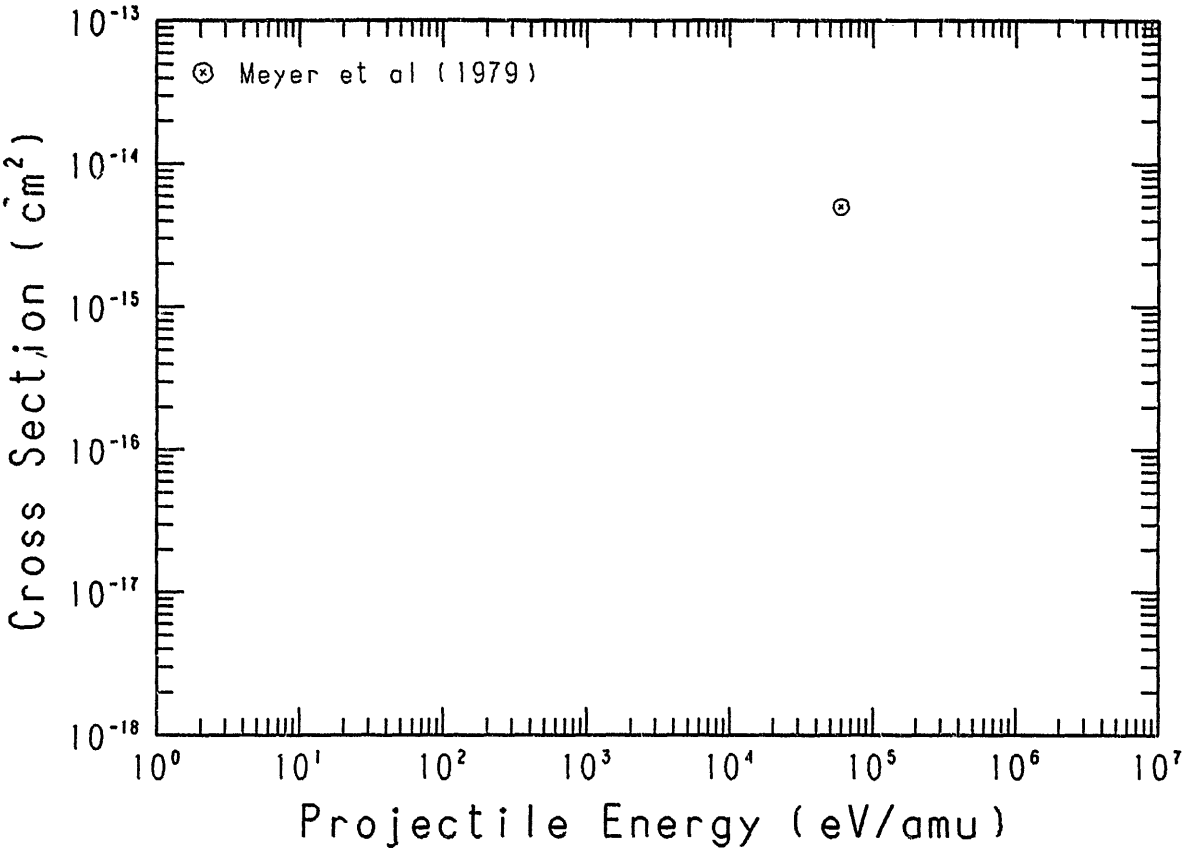


Fig. 193 $Au^{16+} + H_2 \rightarrow Au^{15+}$



IV. GRAPHS

—— CROSS SECTIONS FOR $H + X^{q+} \longrightarrow H + X^{(q+n)+}$ ——

Fig. A1 $Li^{+} + H_2 \rightarrow Li^{2+}$

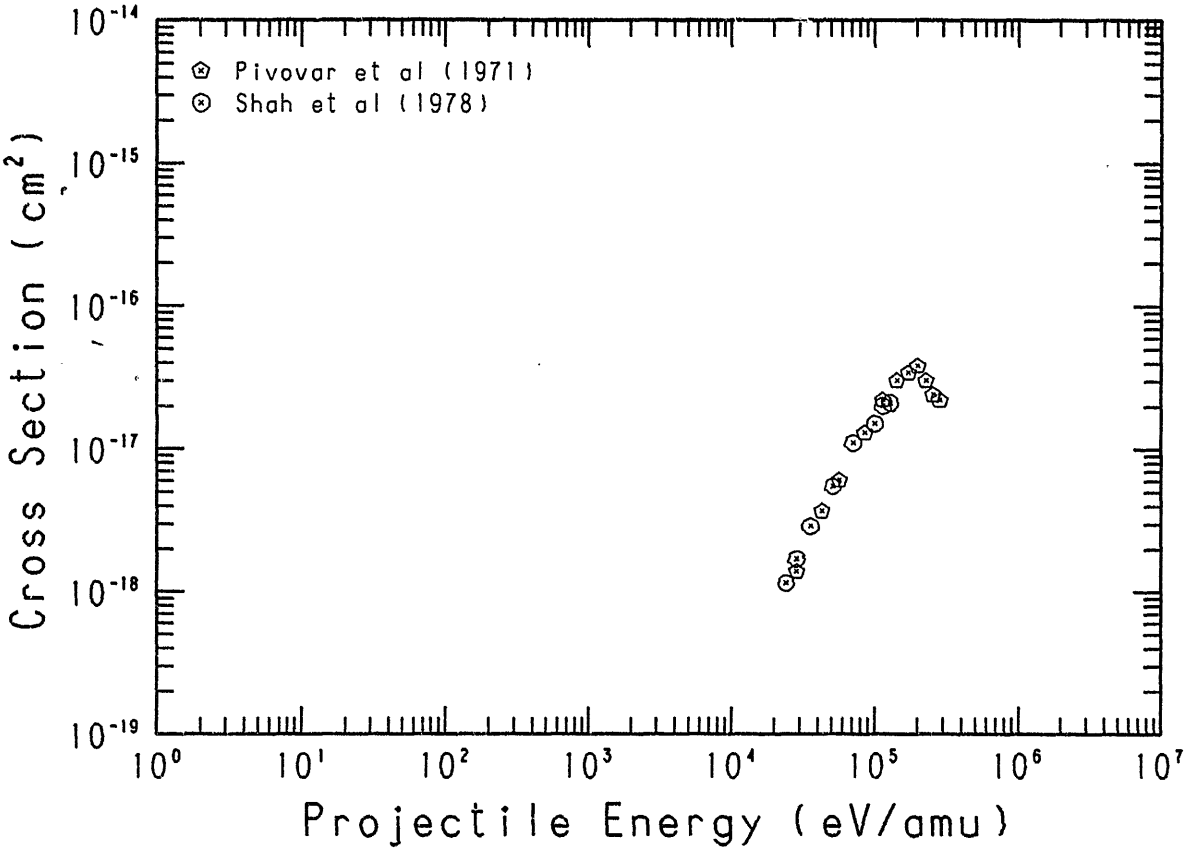


Fig. A2 $Li^{2+} + H_2 \rightarrow Li^{3+}$

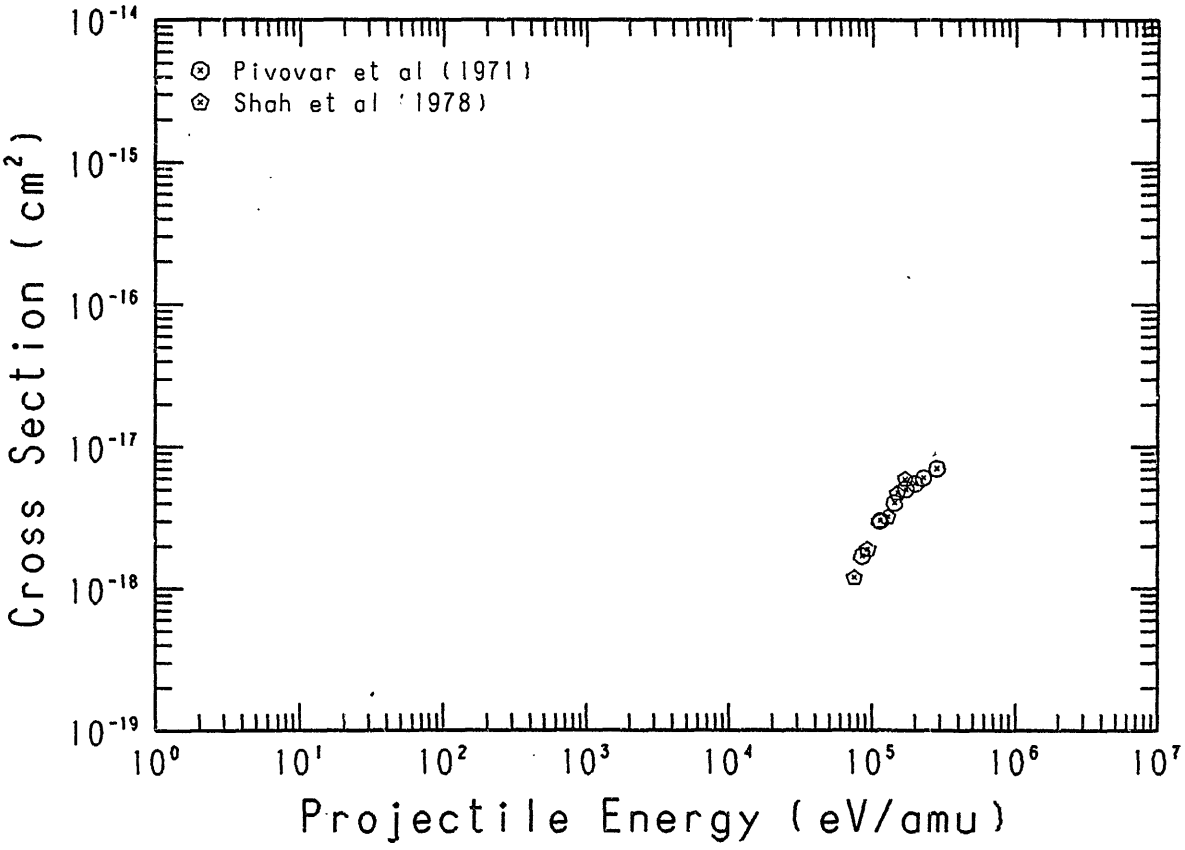


Fig. A3 $B^+ + H_2 \rightarrow B^{2+}$

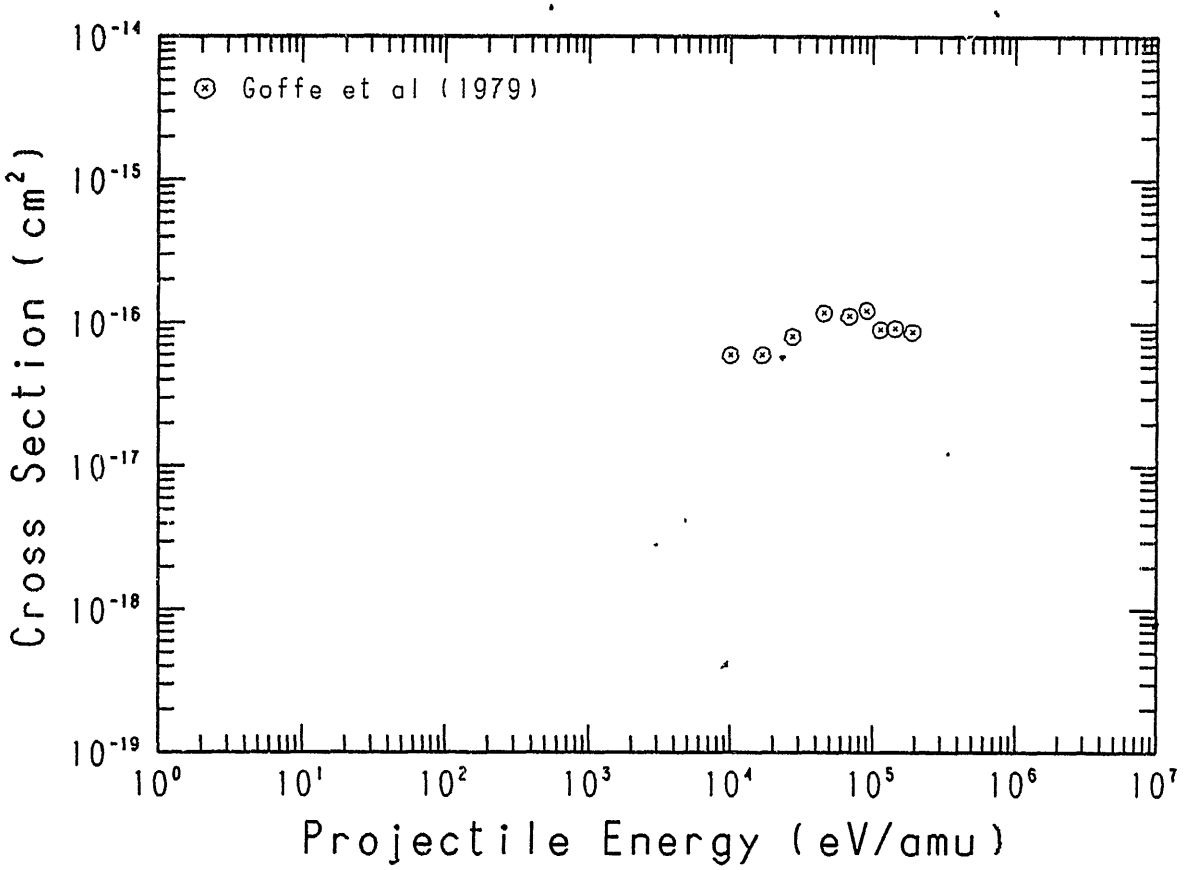


Fig. A4 $B^{2+} + H_2 \rightarrow B^{3+}$

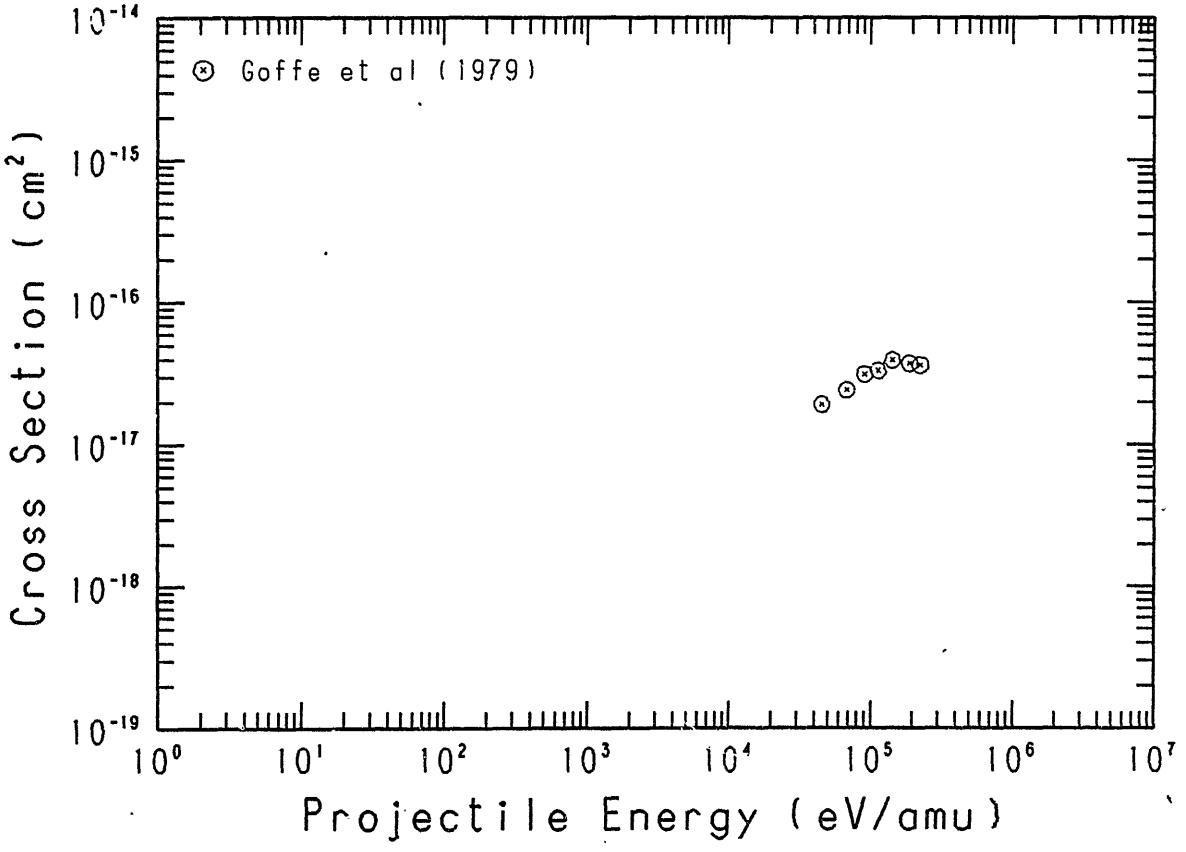


Fig. A5 $C^{+} + H_2 \rightarrow C^{2+}$

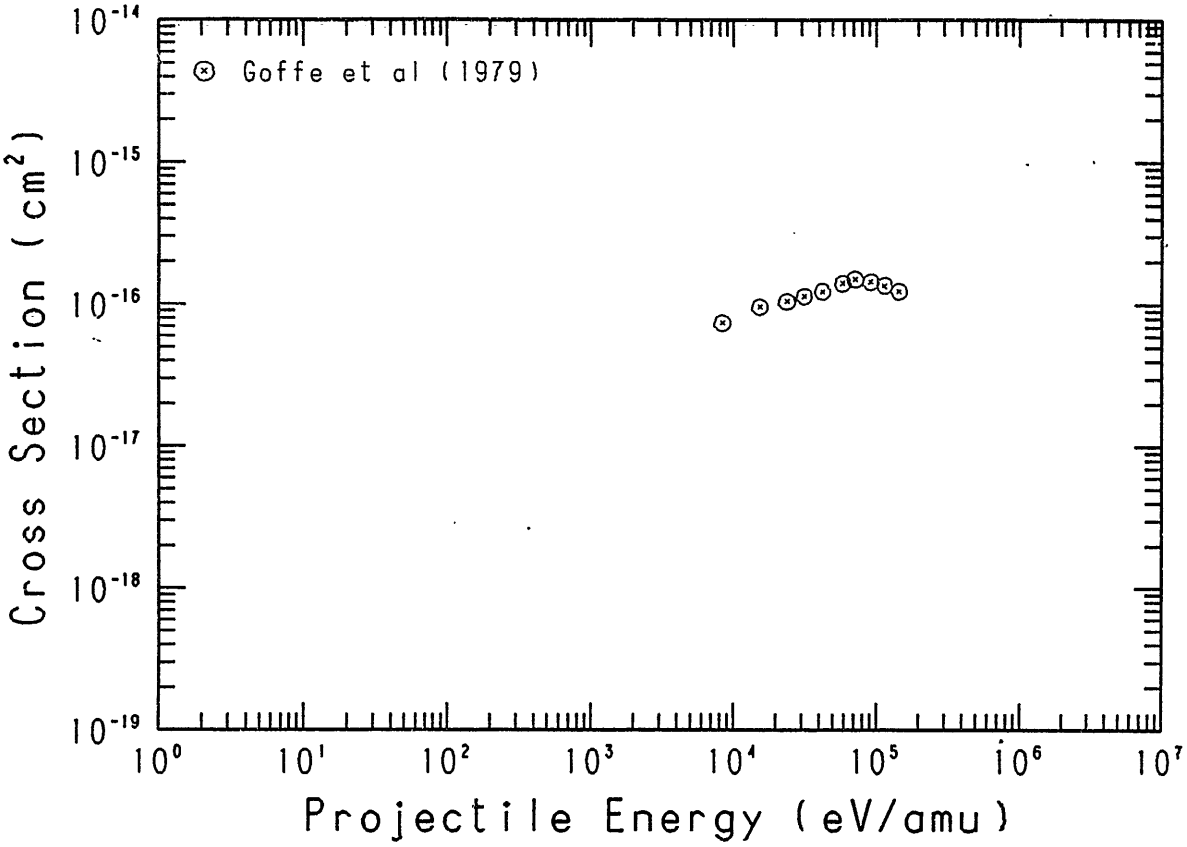


Fig. A6 $C^{2+} + H_2 \rightarrow C^{3+}$

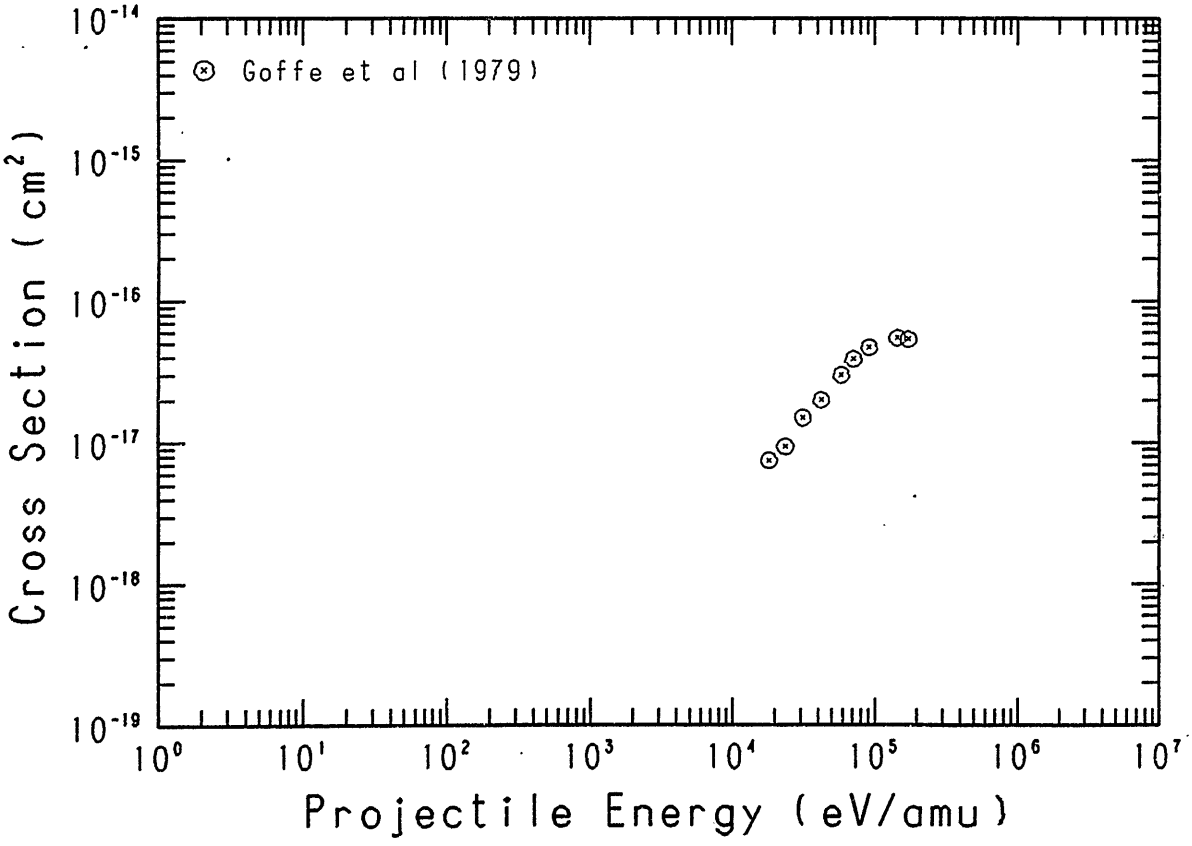


Fig. A7 $C^{3+} + H_2 \rightarrow C^{4+}$

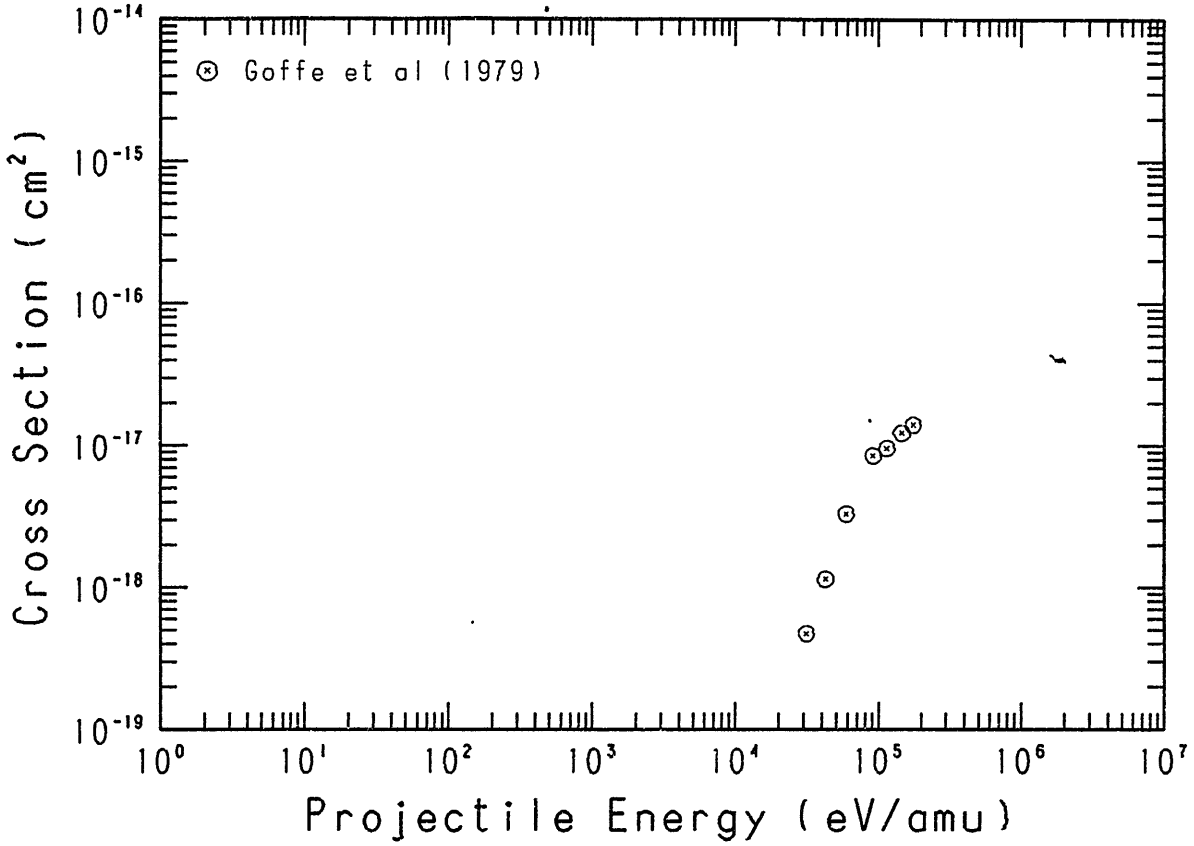


Fig. A8 $C^{4+} + H_2 \rightarrow C^{5+}$

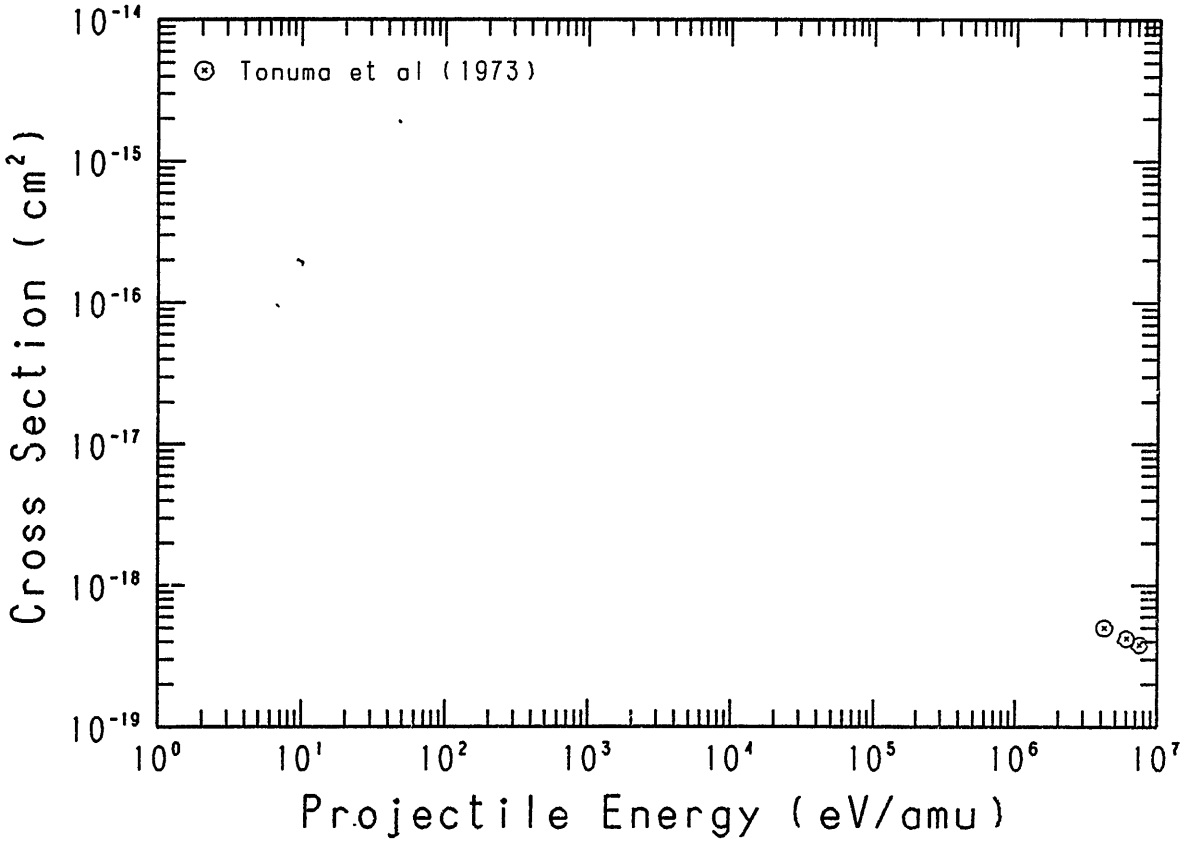


Fig. A9 $N^{4+} + H_2 \rightarrow N^{5+}$

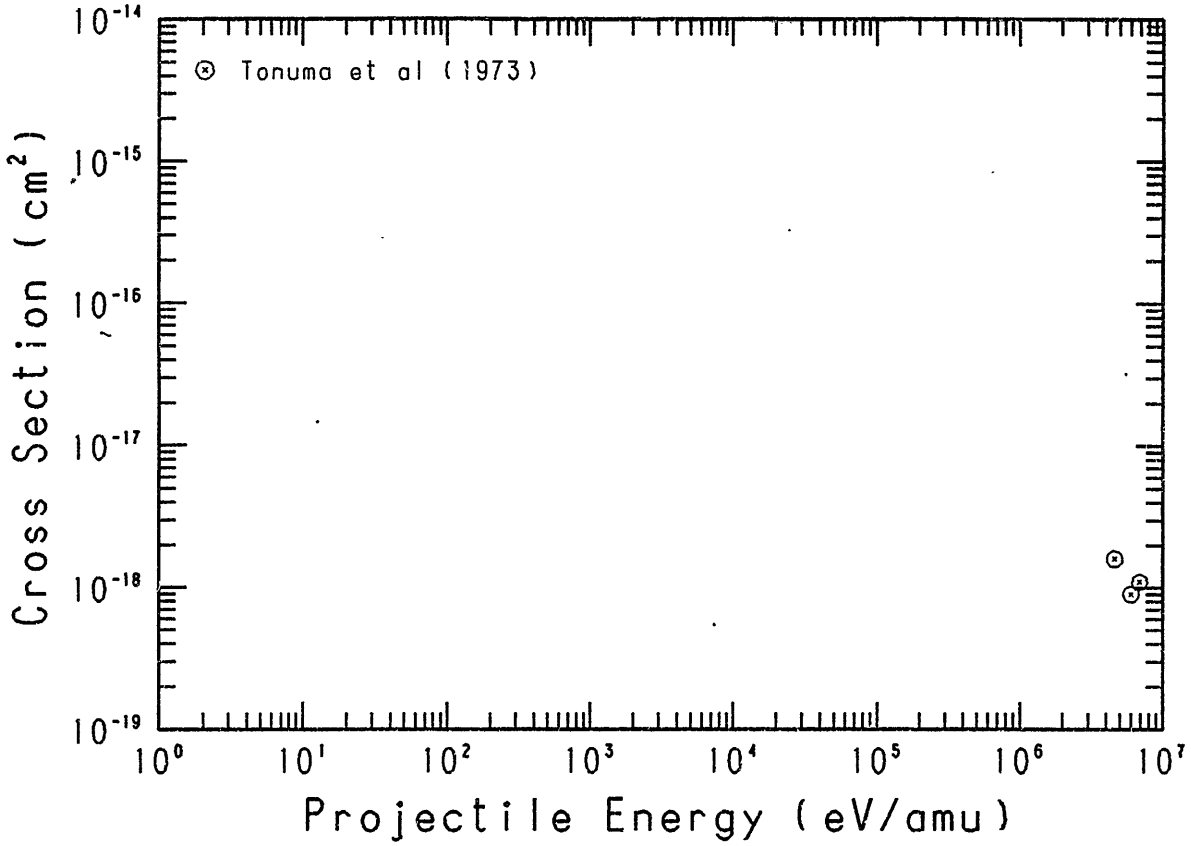


Fig. A10 $O^{2+} + H_2 \rightarrow O^{3+}$

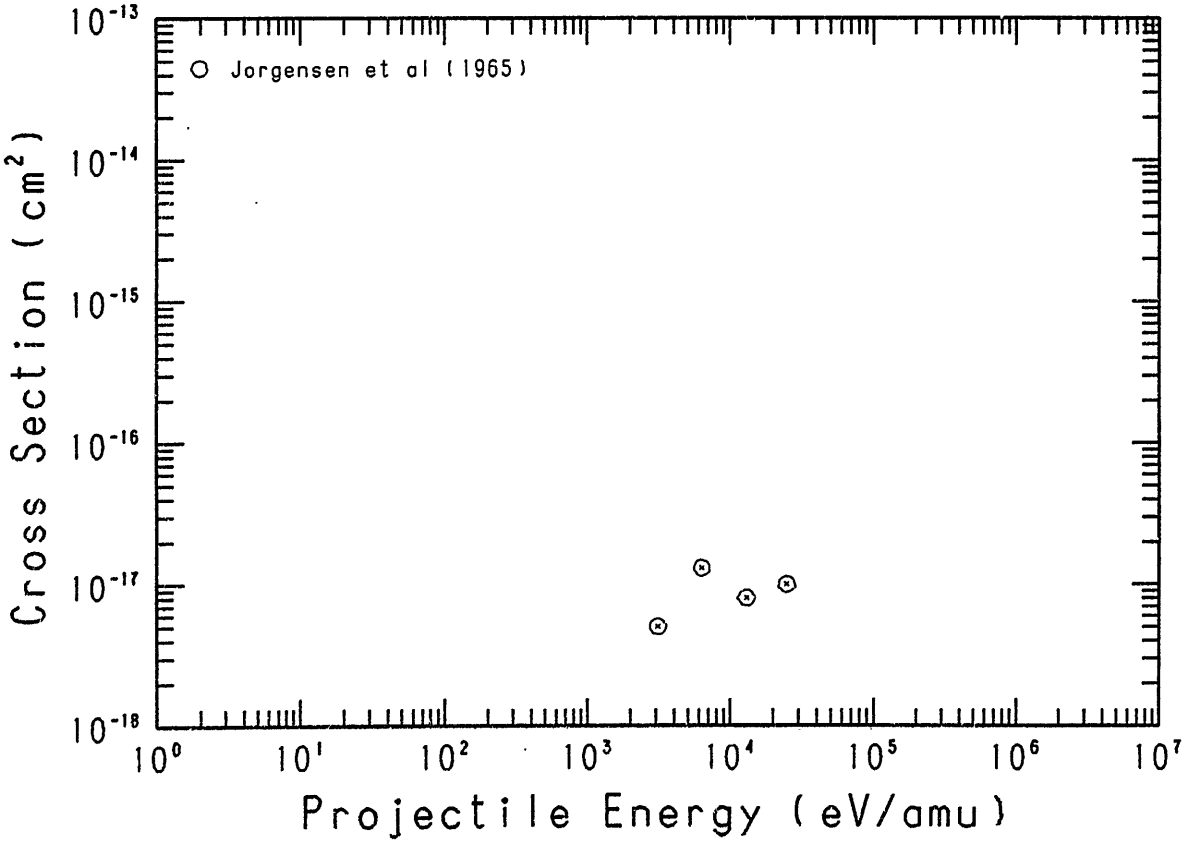


Fig. A11 $Si^{3+} + H_2 \rightarrow Si^{4+}$

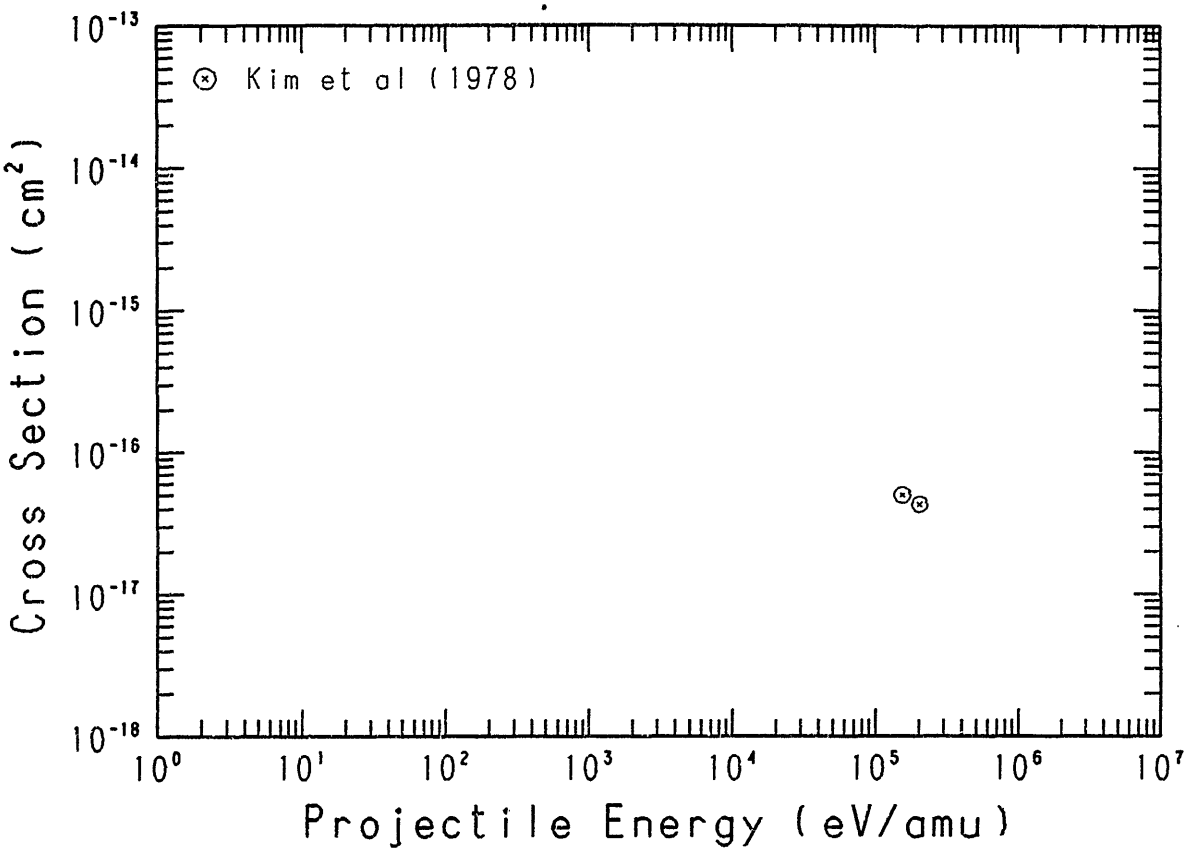


Fig. A12 $Si^{4+} + H_2 \rightarrow Si^{5+}$

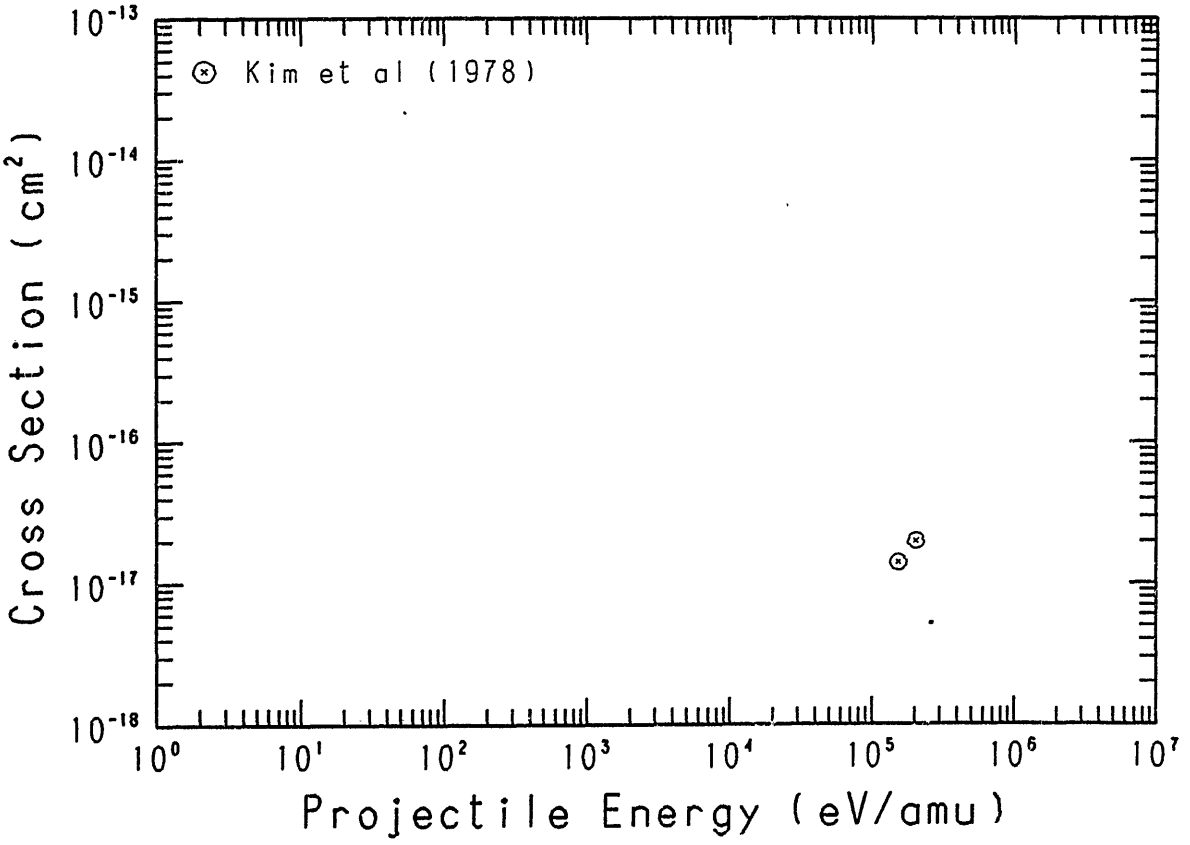


Fig. A13 $Cl^{2+} + H_2 \rightarrow Cl^{3+}$

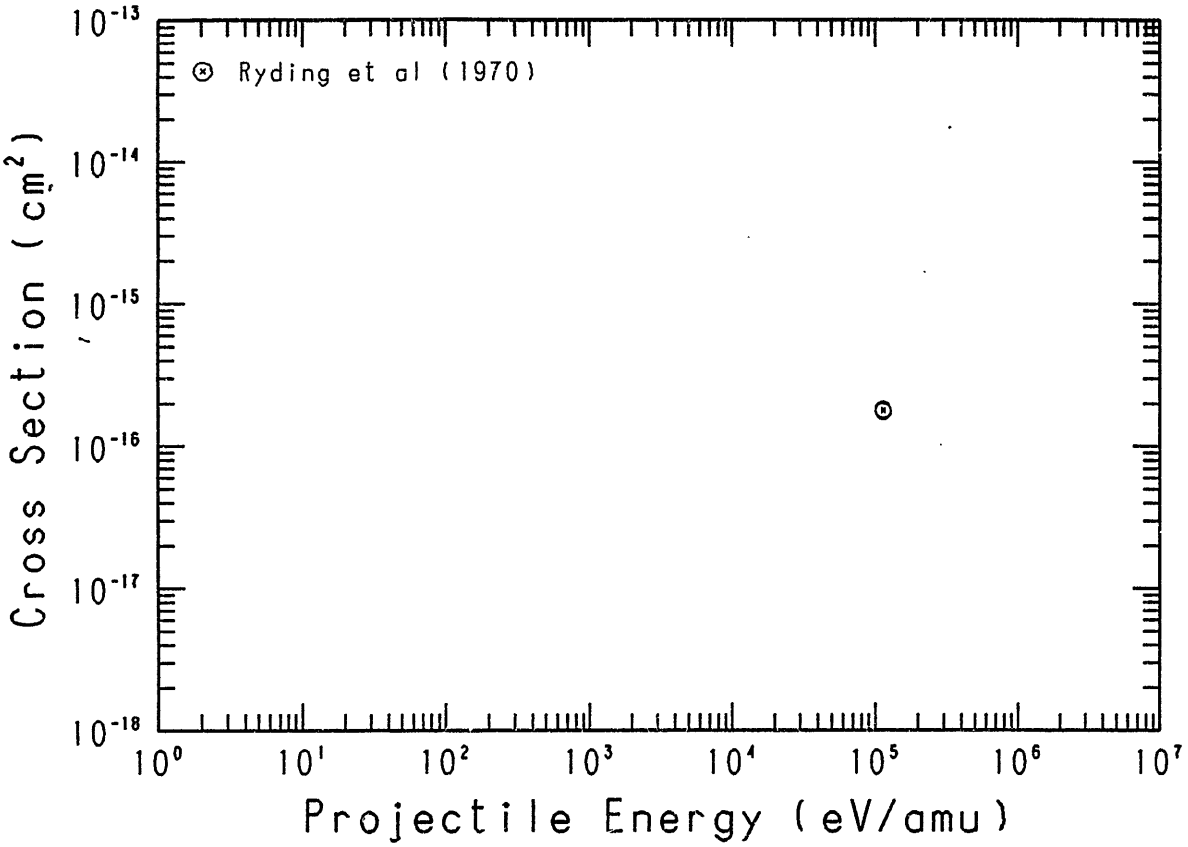


Fig. A14 $Cl^{3+} + H_2 \rightarrow Cl^{4+}$

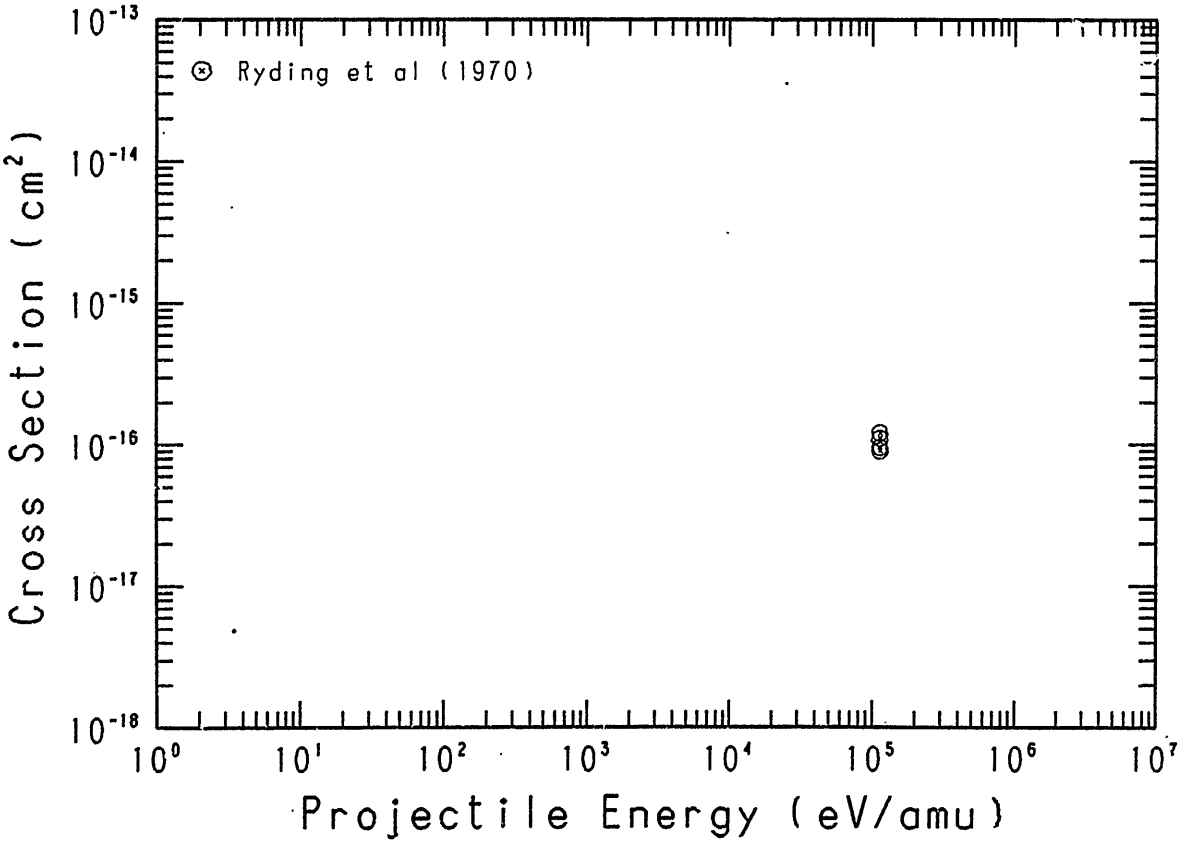


Fig. A15 $K^+ + H_2 \rightarrow K^{2+}$

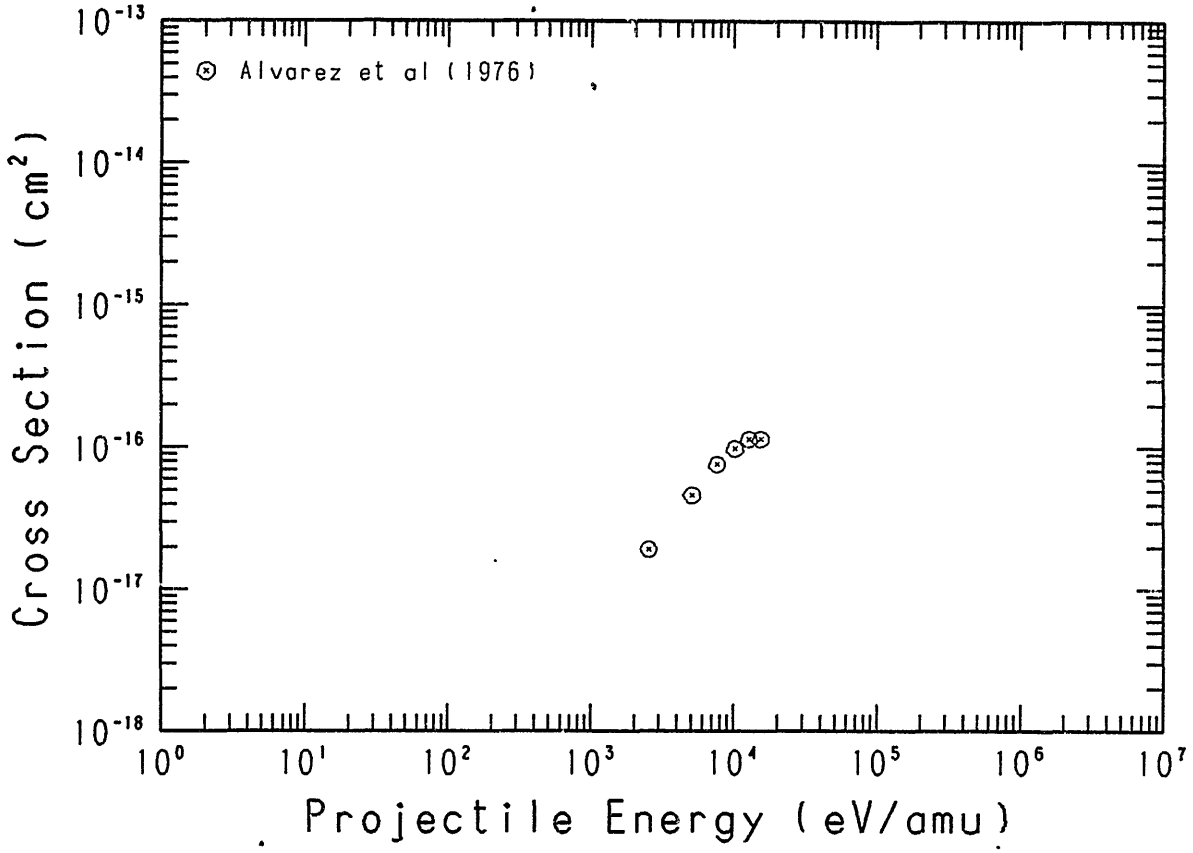


Fig. A16 $Fe^{20+} + H_2 \rightarrow Fe^{21+}$

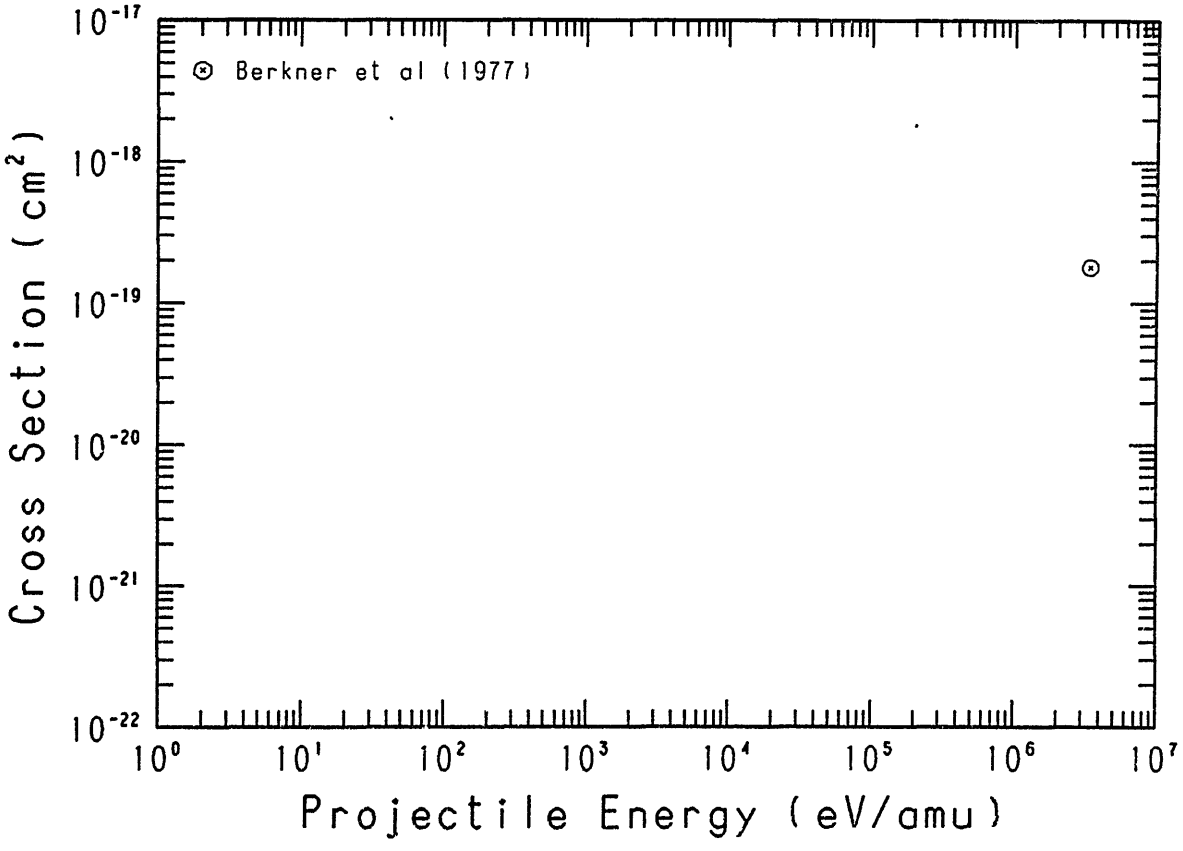


Fig. A17 $Fe^{21+} + H_2 \rightarrow Fe^{22+}$

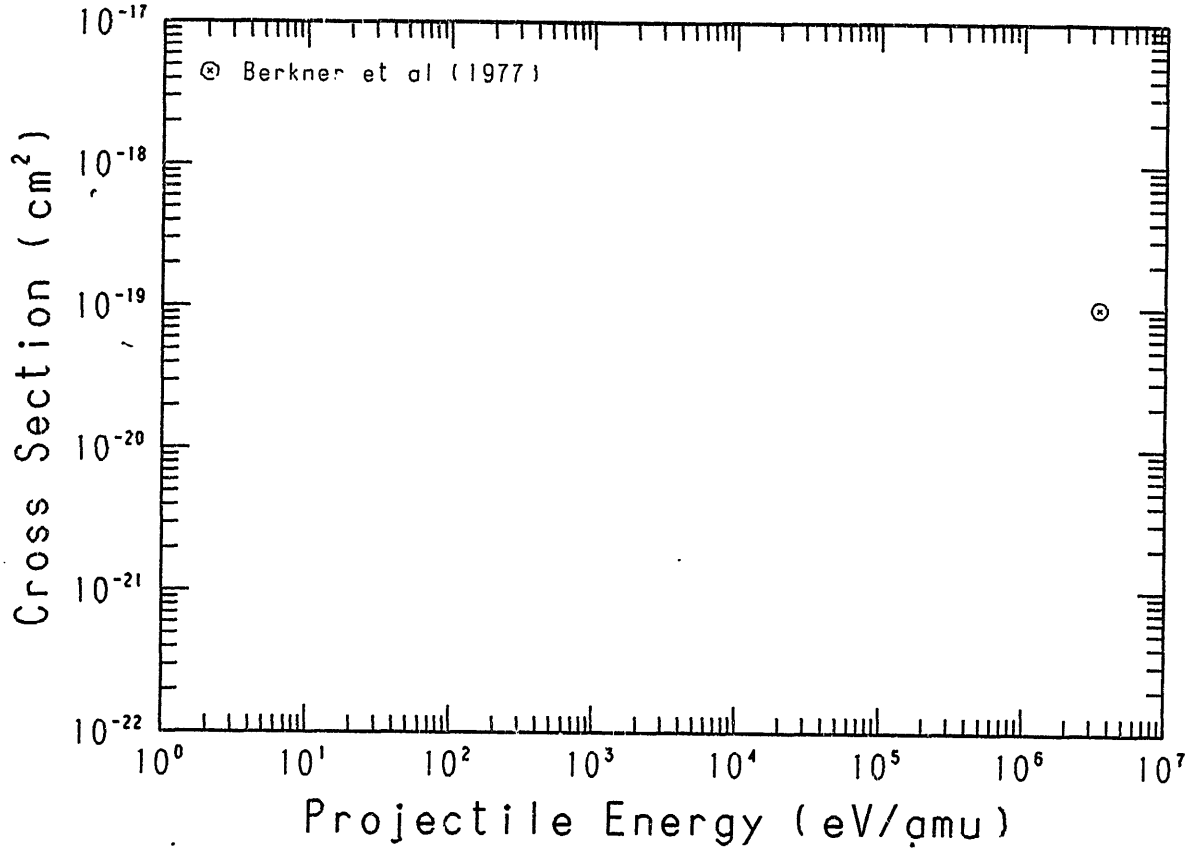


Fig. A18 $Fe^{22+} + H_2 \rightarrow Fe^{23+}$

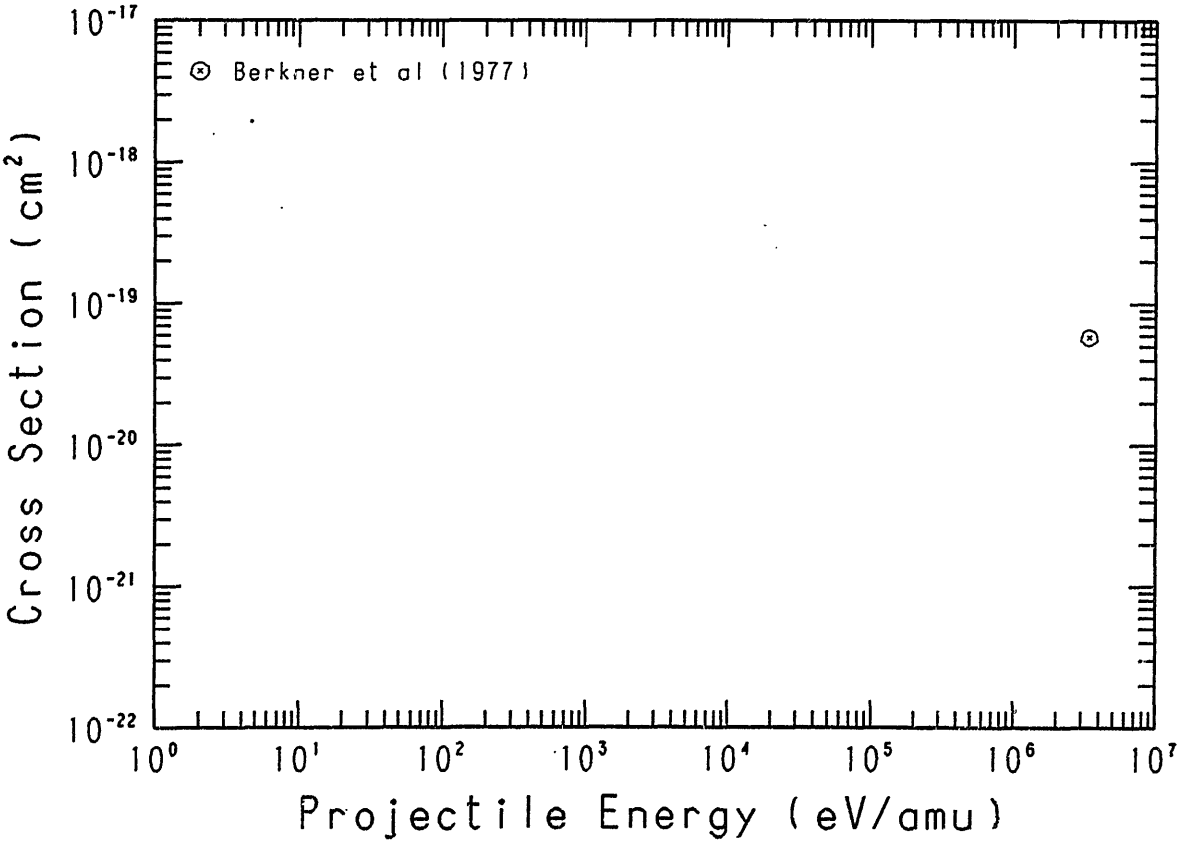


Fig. A19 $Fe^{23+} + H_2 \rightarrow Fe^{24+}$

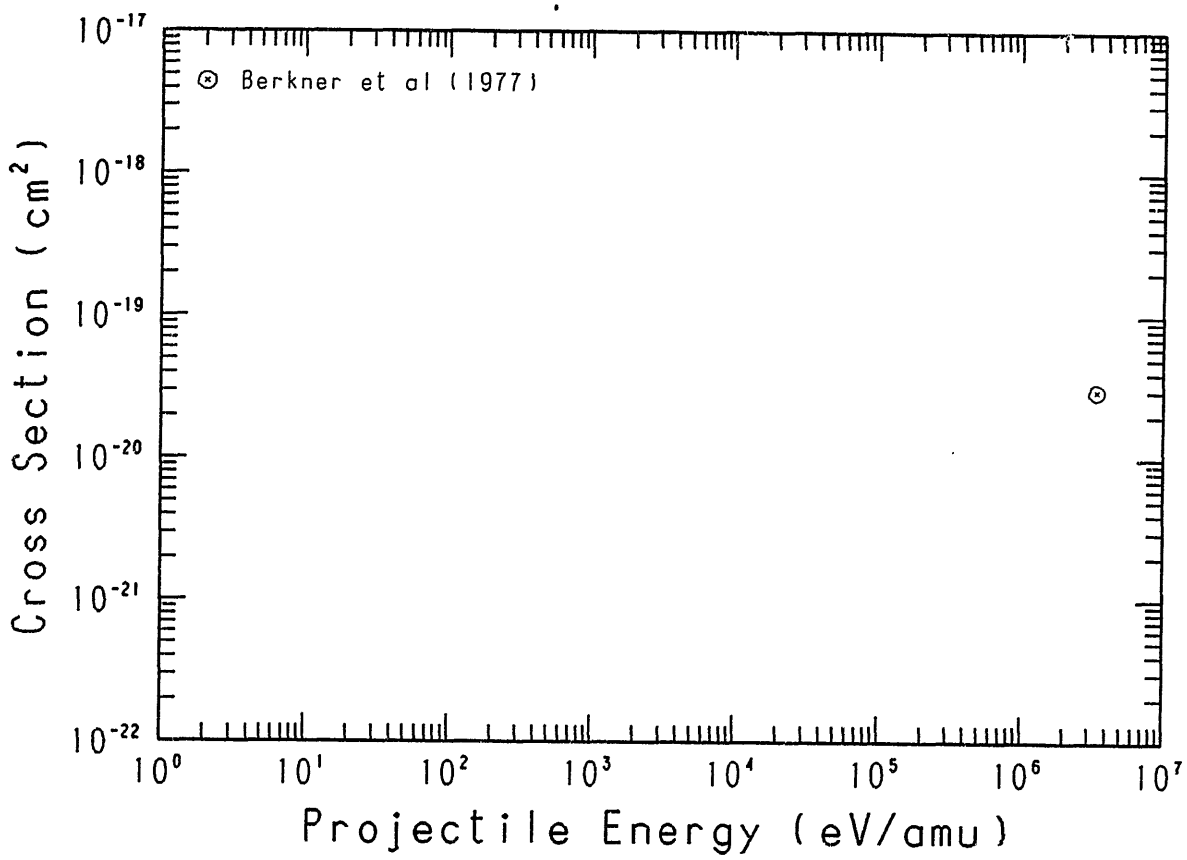


Fig. A20 $Fe^{24+} + H_2 \rightarrow Fe^{25+}$

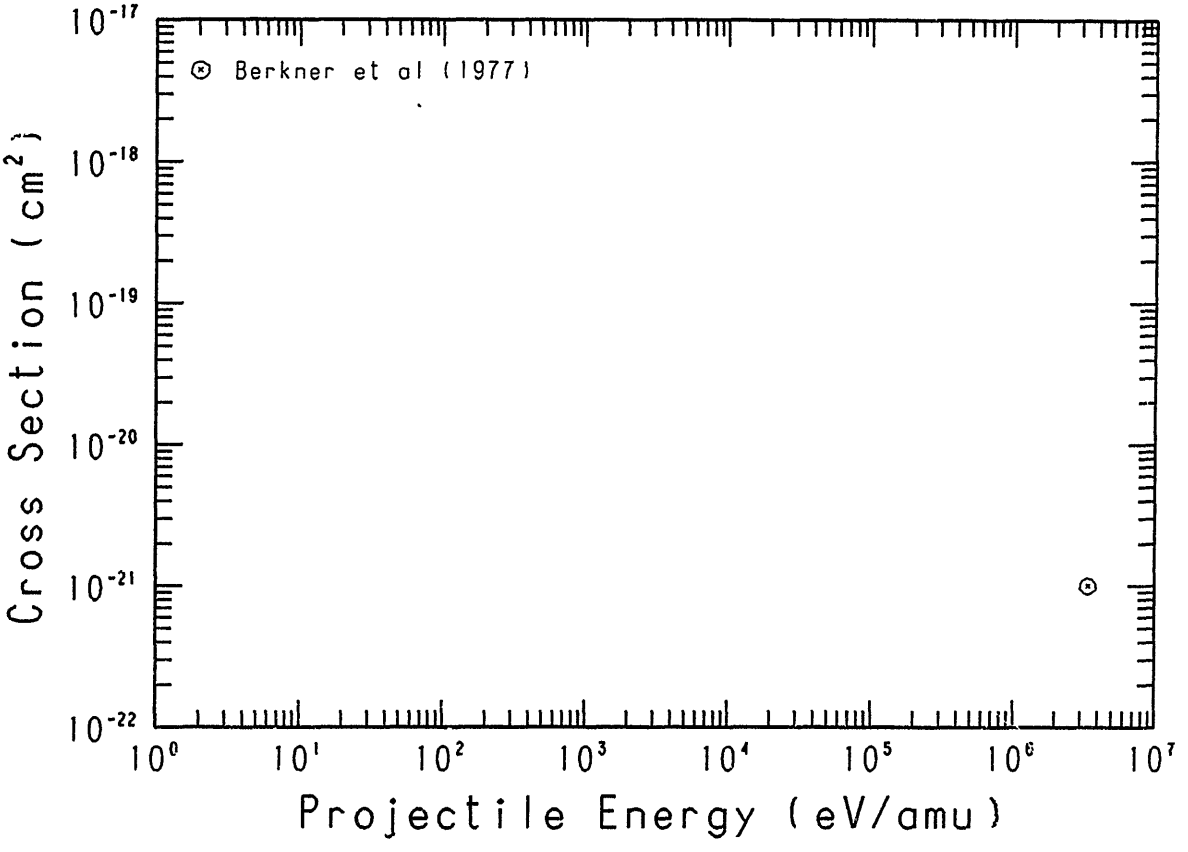


Fig. A21 $Fe^{25+} + H_2 \rightarrow Fe^{26+}$

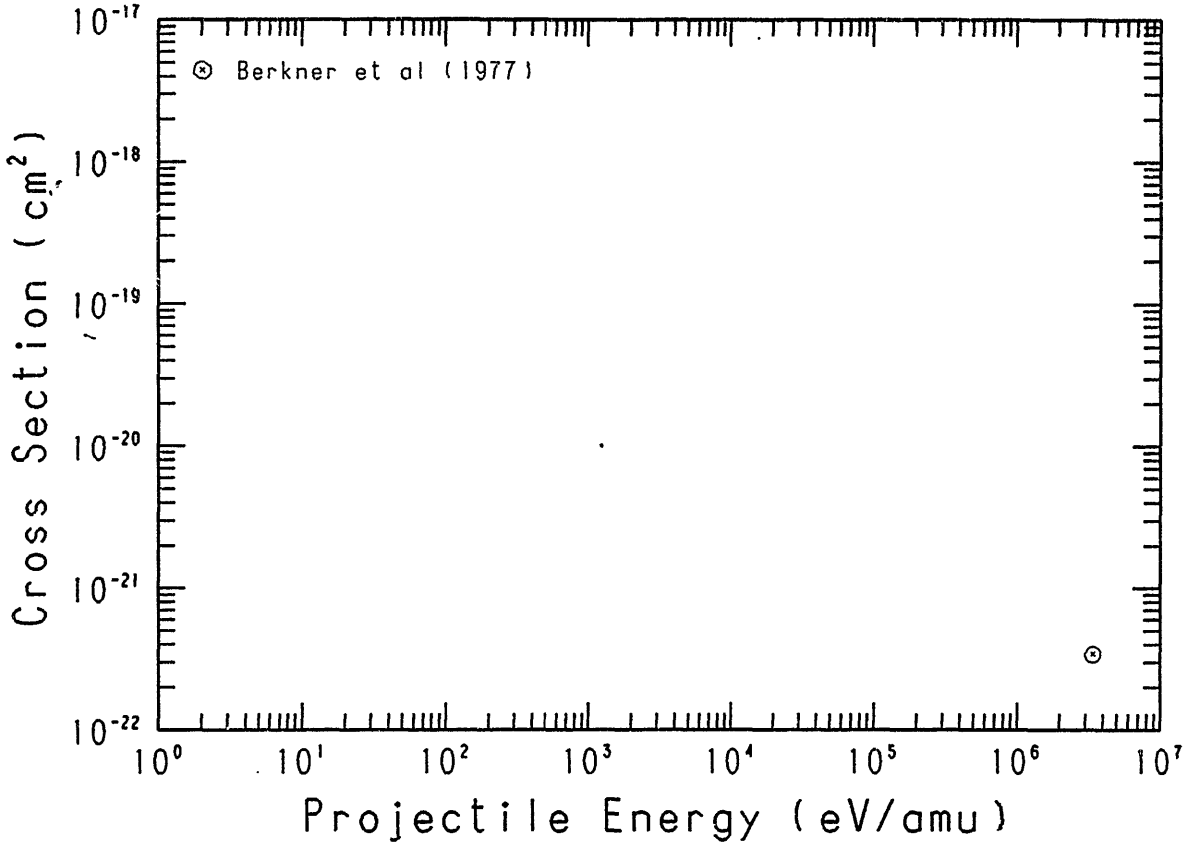


Fig. A22 $Br^{3+} + H_2 \rightarrow Br^{4+}$

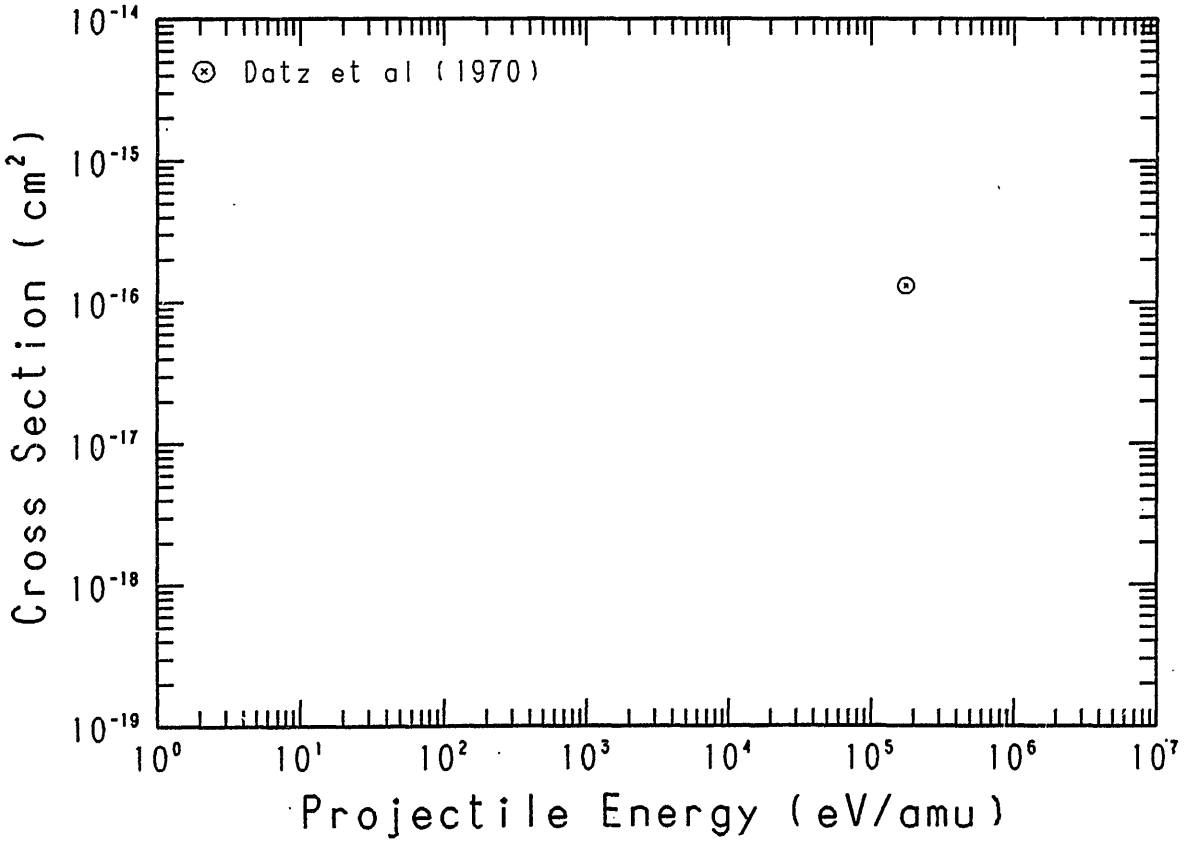


Fig. A23 $Br^{4+} + H_2 \rightarrow Br^{5+}$

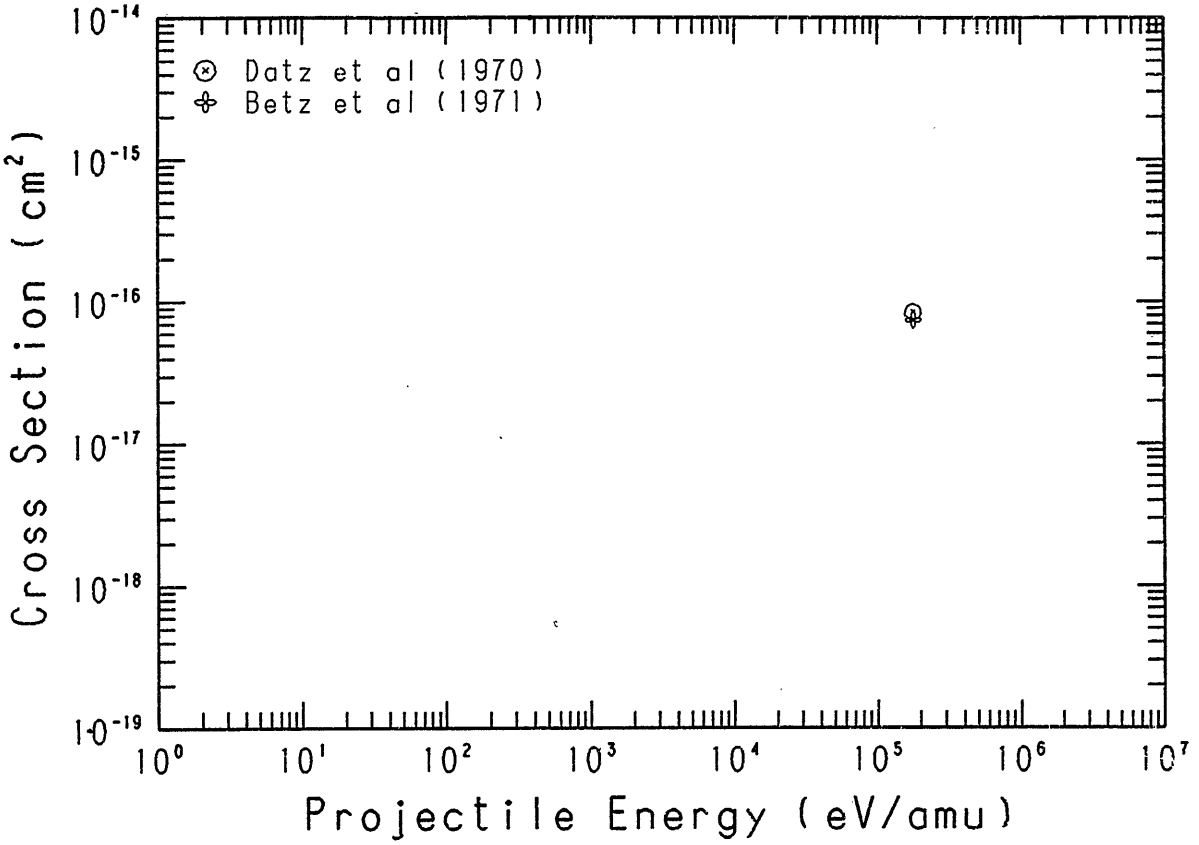


Fig. A24 $Br^{4+} + H_2 \rightarrow Br^{6+}$

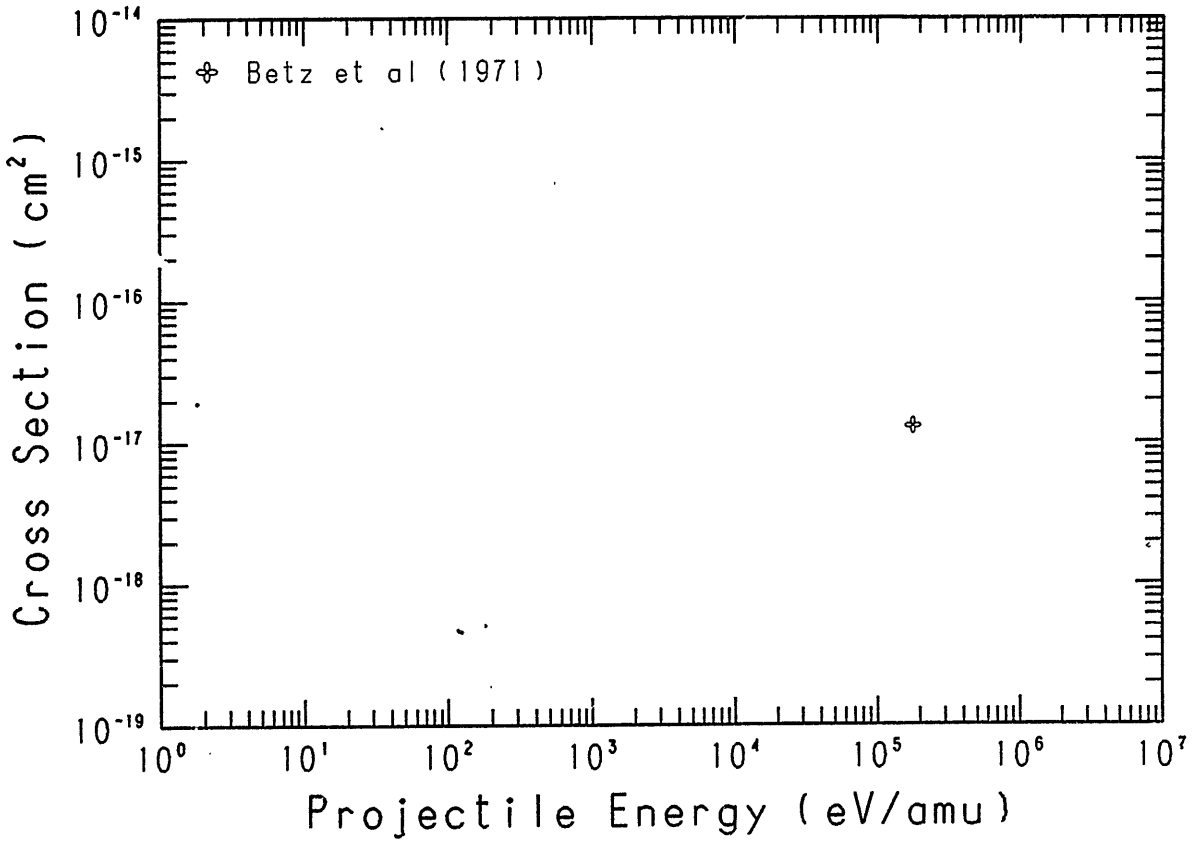


Fig. A25 $Br^{4+} + H_2 \rightarrow Br^{7+}$

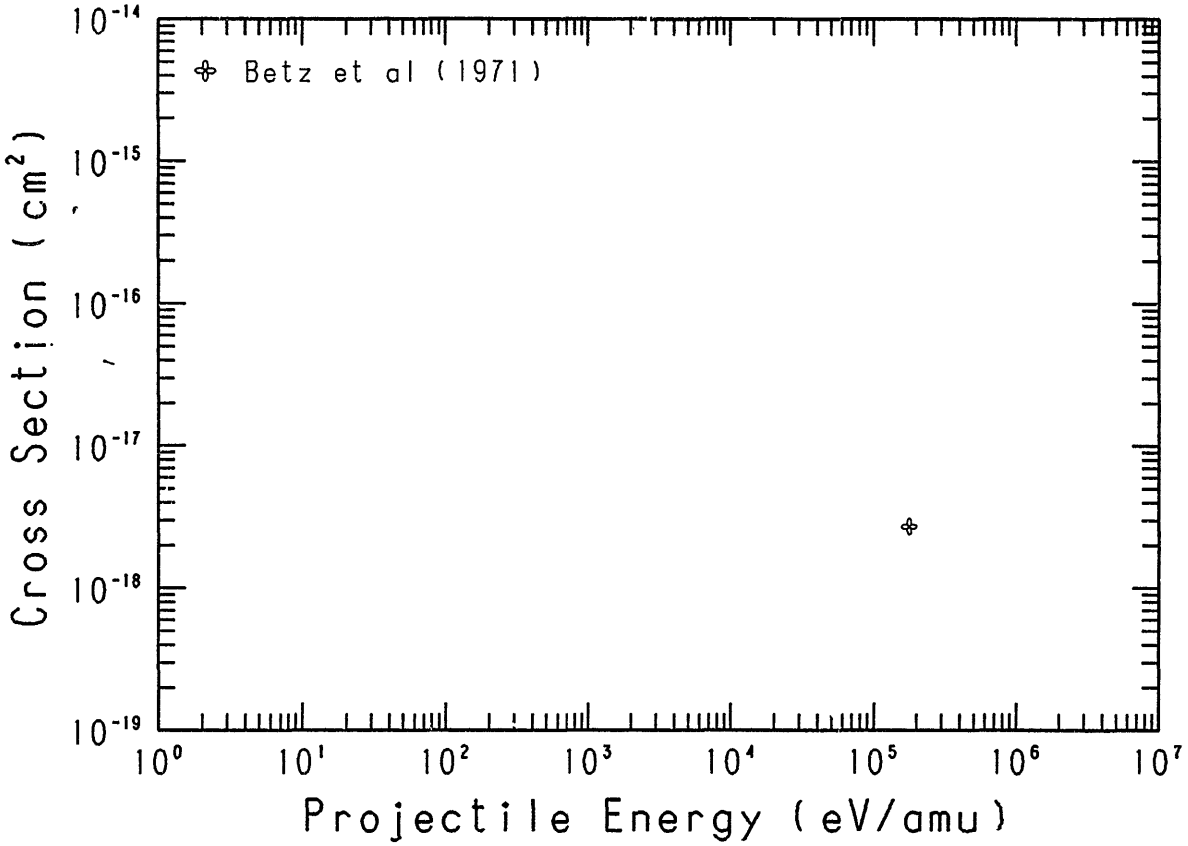


Fig. A26 $Br^{4+} + H_2 \rightarrow Br^{8+}$

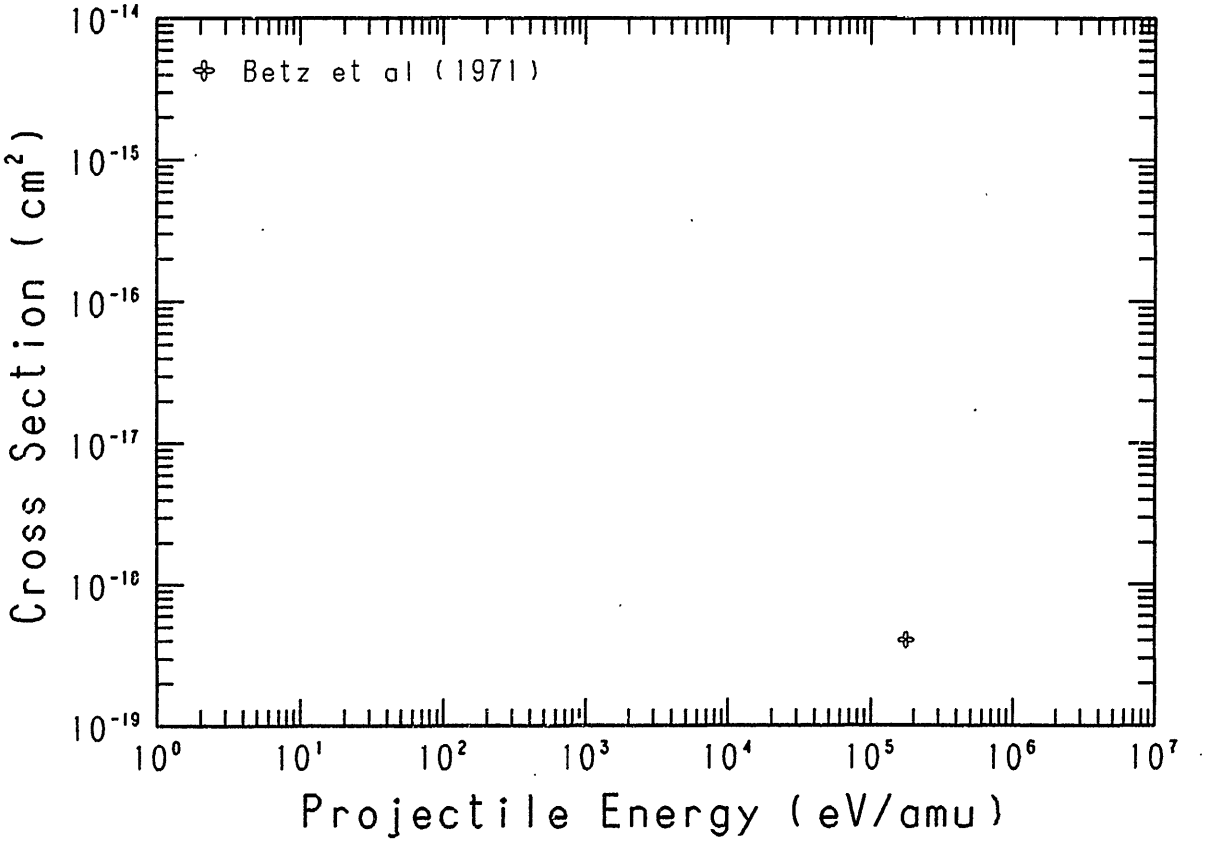


Fig. A27 $Br^{5+} + H_2 \rightarrow Br^{6+}$

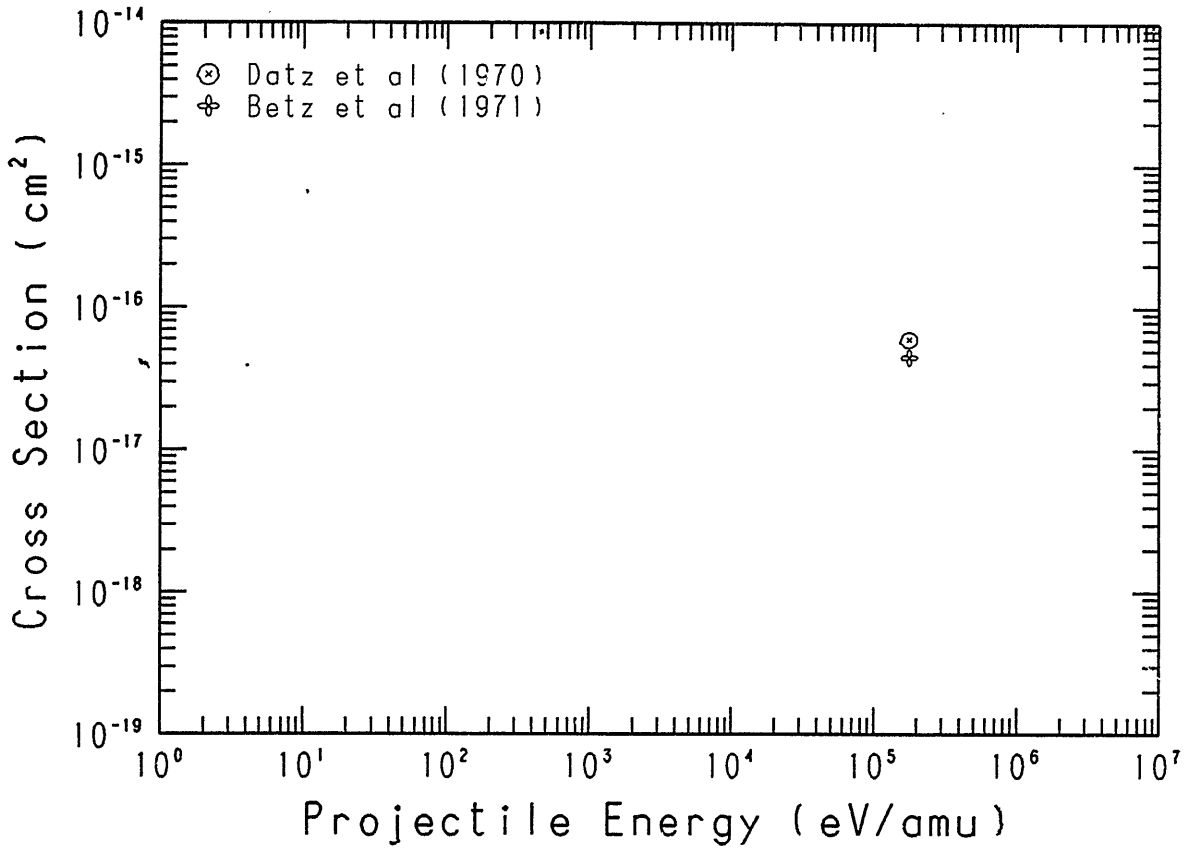


Fig. A28 $Br^{5+} + H_2 \rightarrow Br^{7+}$

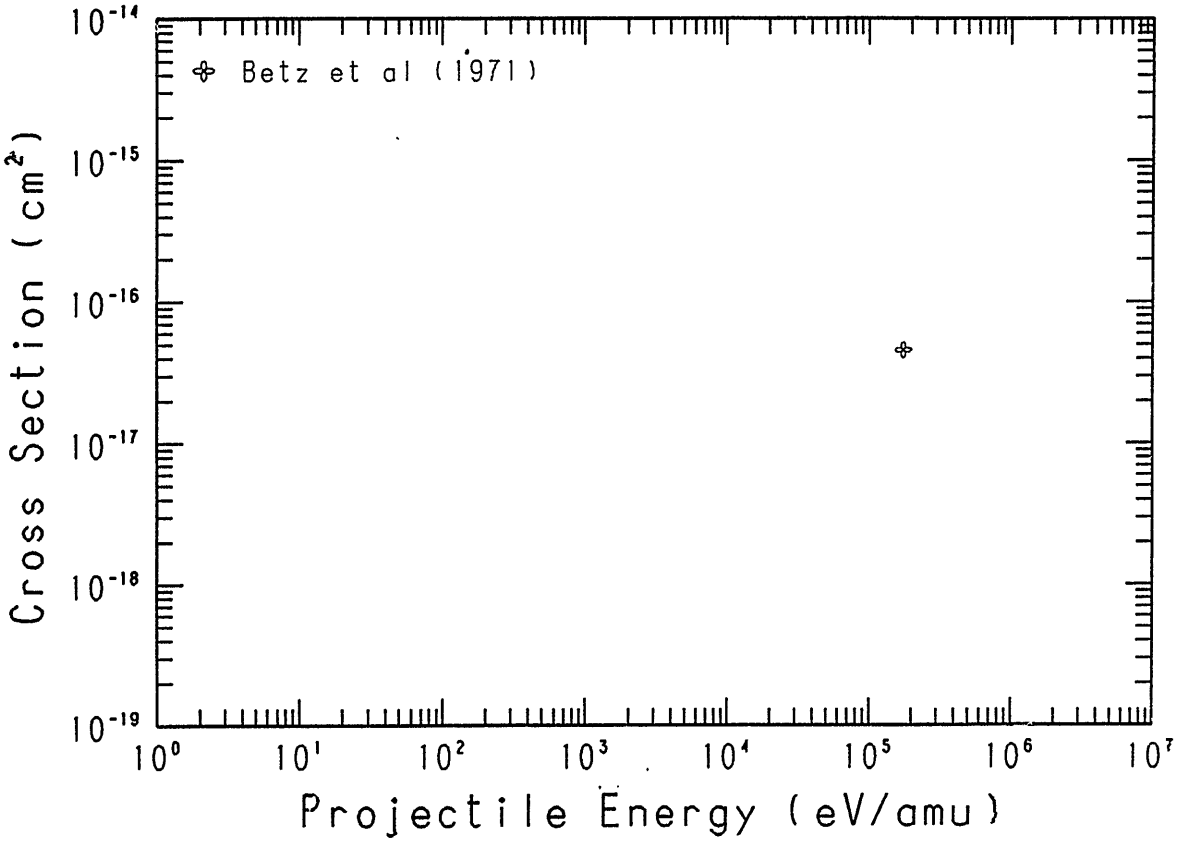


Fig. A29 $Br^{6+} + H_2 \rightarrow Br^{7+}$

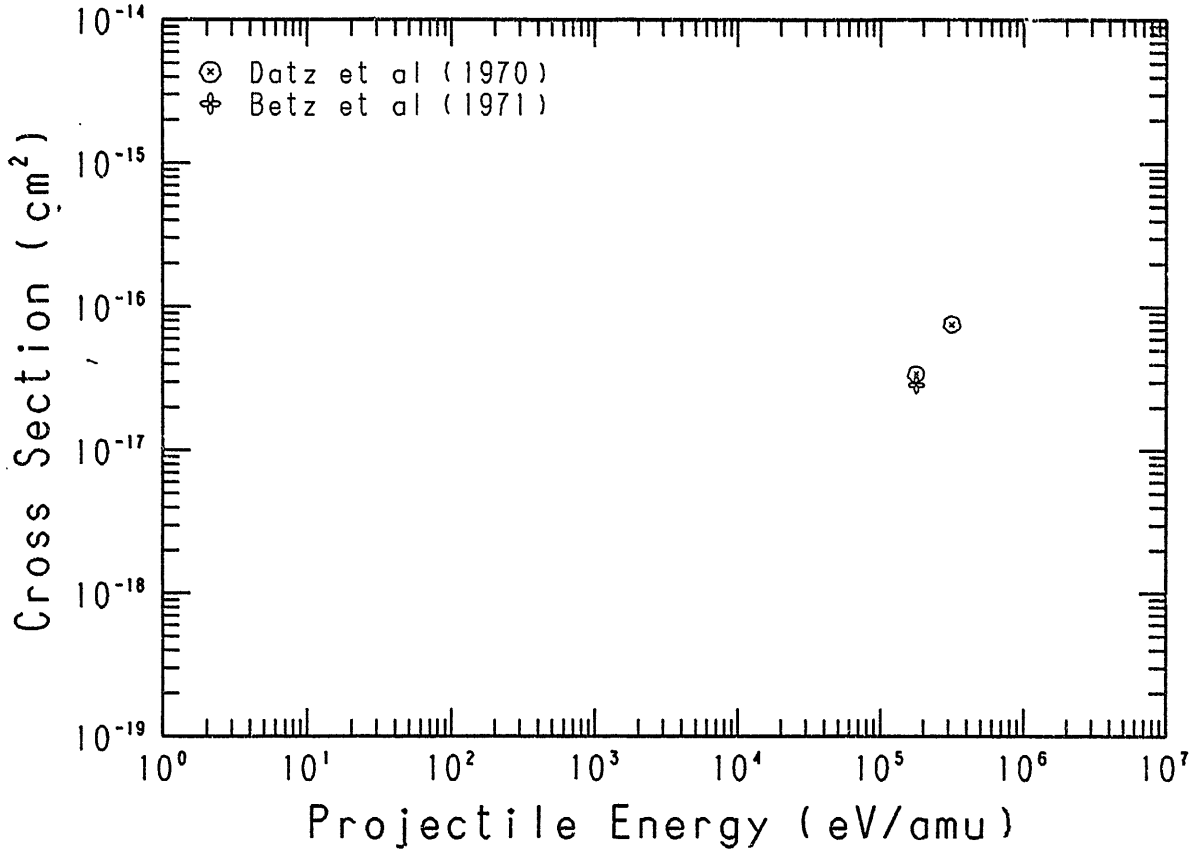


Fig. A30 $Br^{6+} + H_2 \rightarrow Br^{8+}$

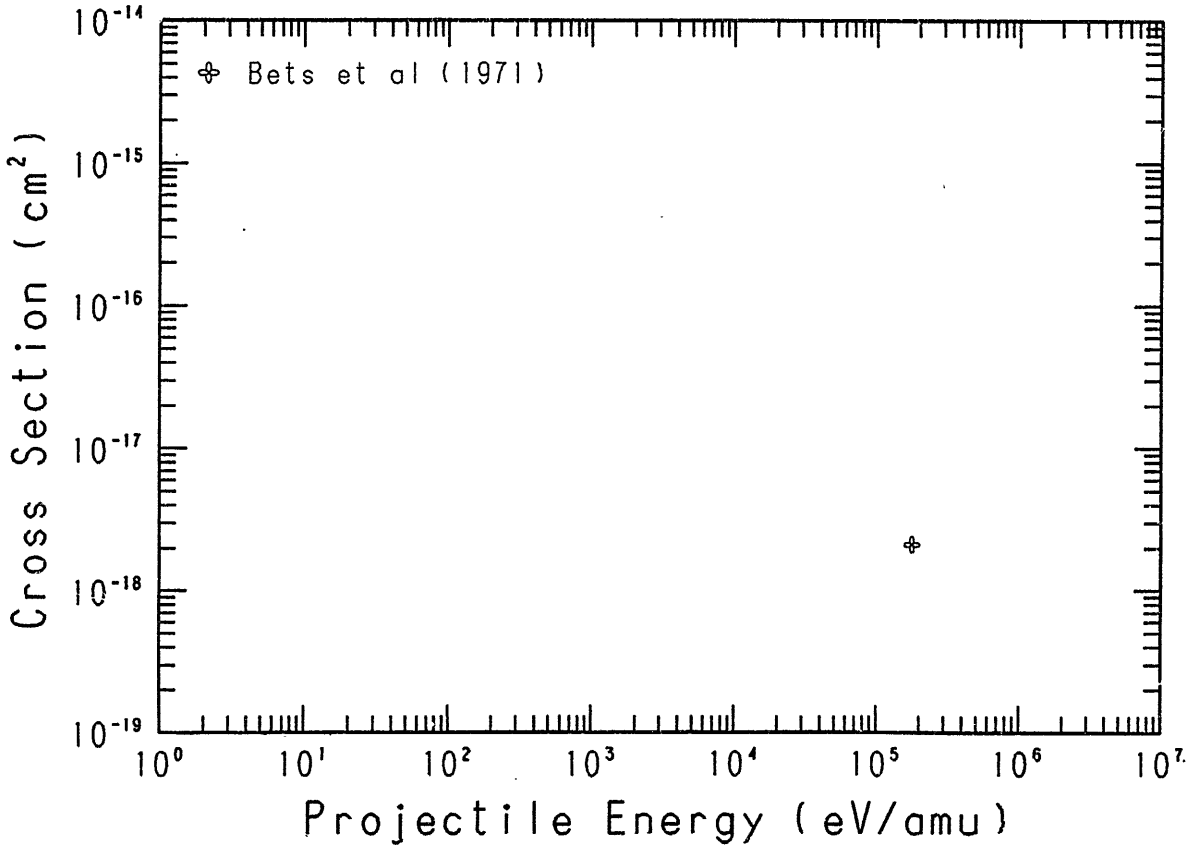


Fig. A31 $Br^{7+} + H_2 \rightarrow Br^{8+}$

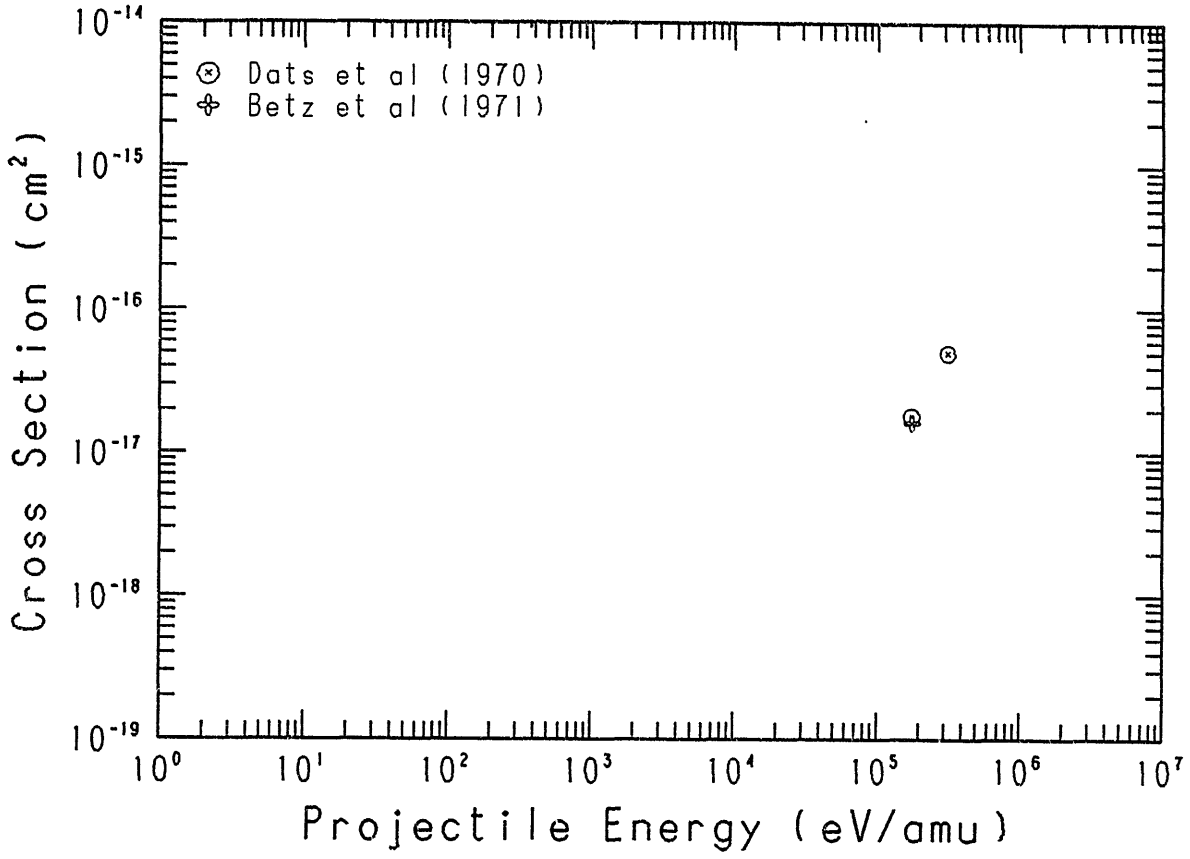


Fig. A32 $Br^{7+} + H_2 \rightarrow Br^{9+}$

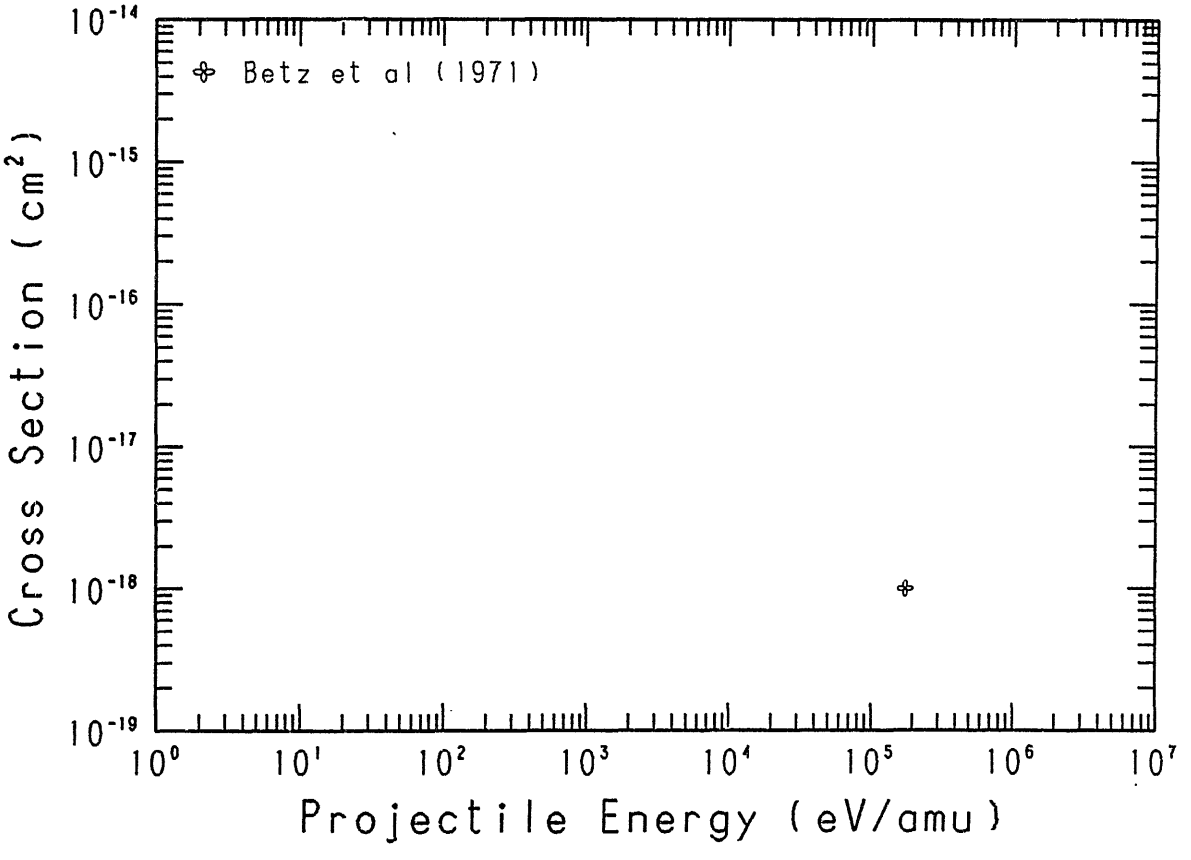


Fig. A33 $Br^{8+} + H_2 \rightarrow Br^{9+}$

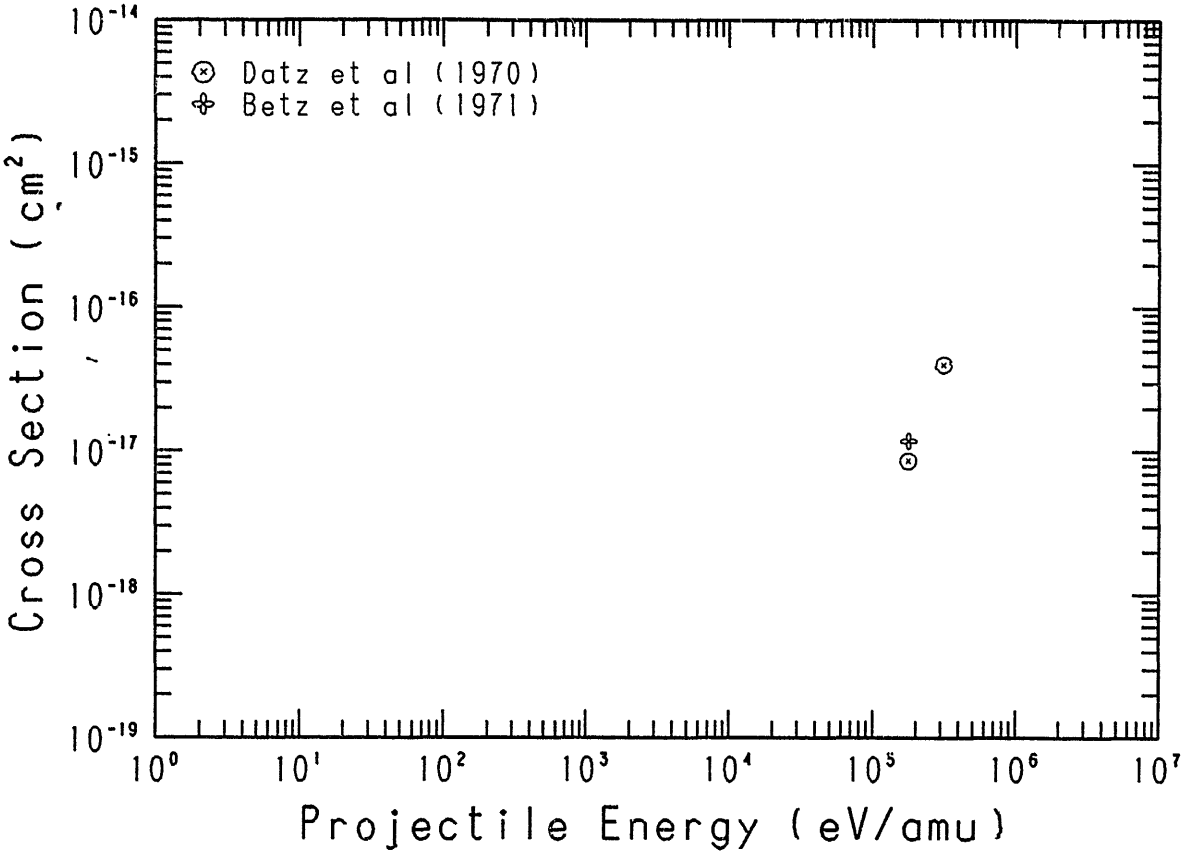


Fig. A34 $Br^{8+} + H_2 \rightarrow Br^{10+}$

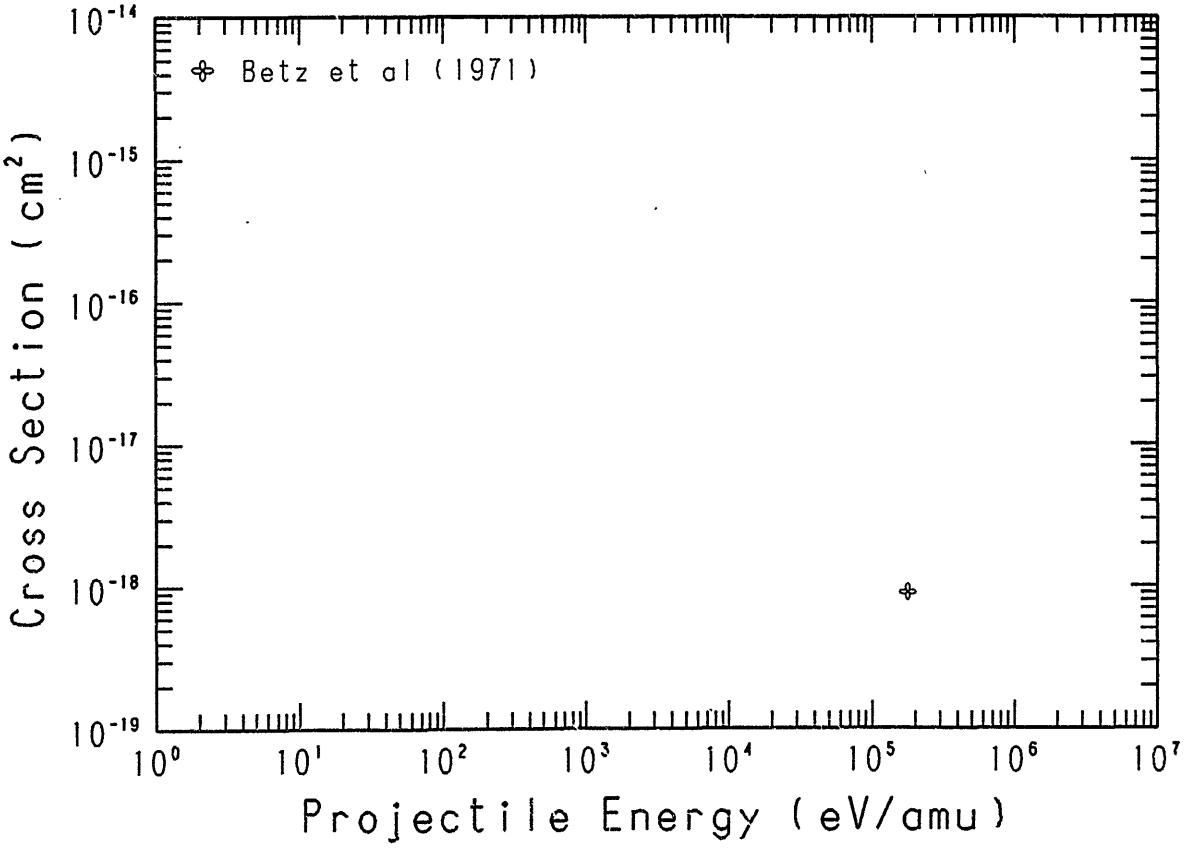


Fig. A35 $Br^{9+} + H_2 \rightarrow Br^{10+}$

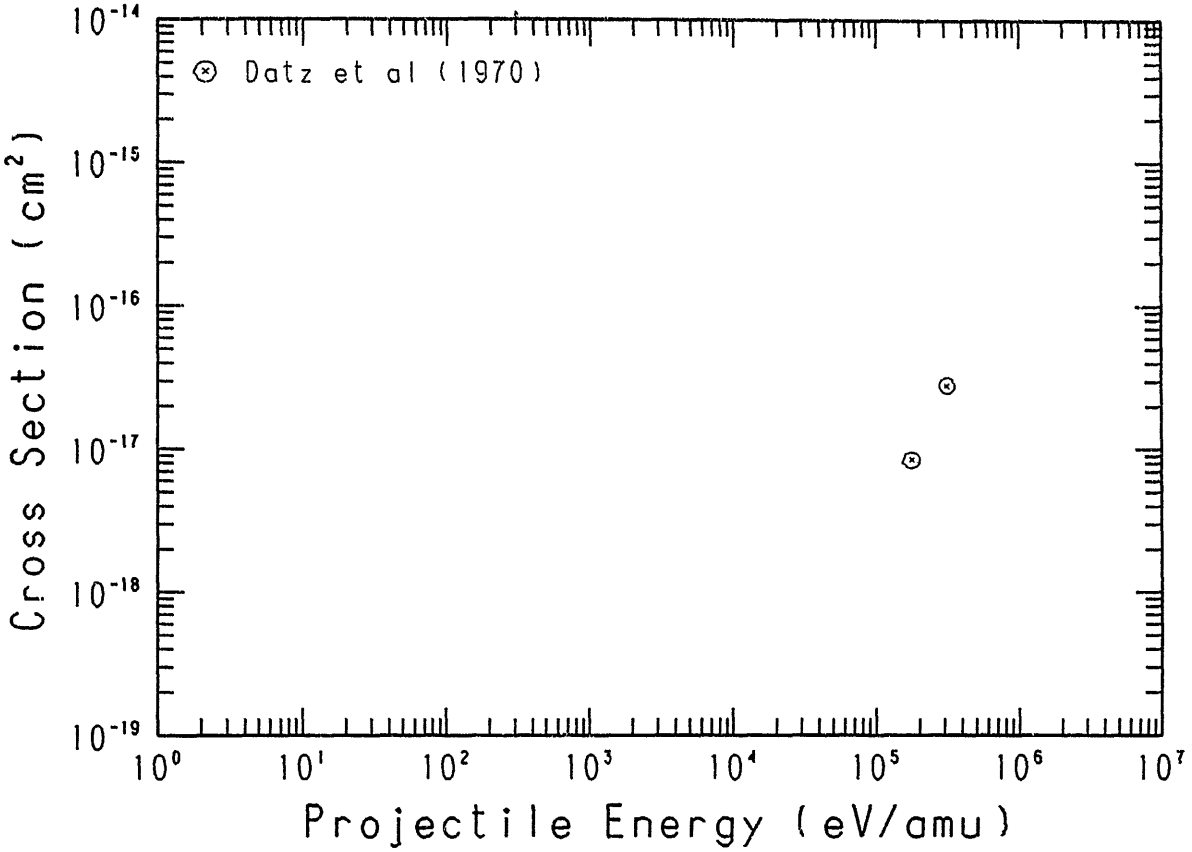


Fig. A36 $Br^{10+} + H_2 \rightarrow Br^{11+}$

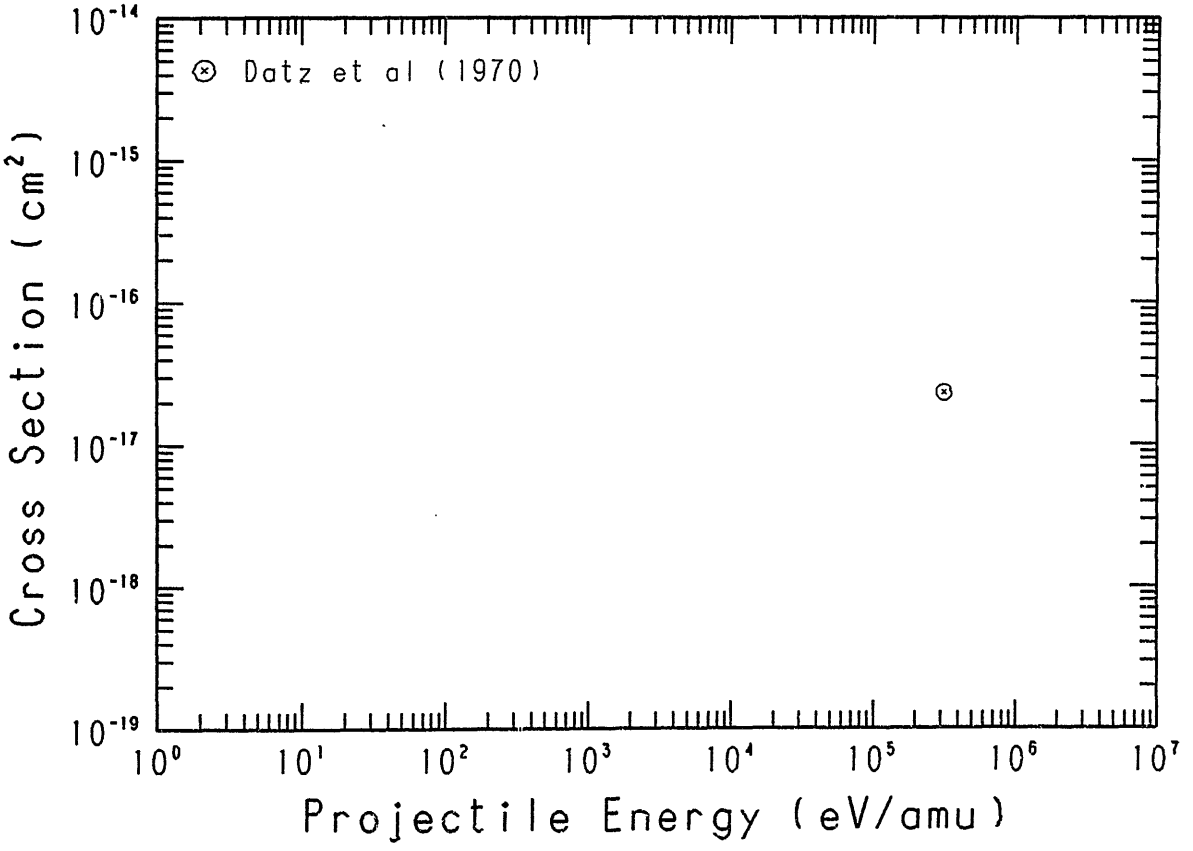


Fig. A37 $Br^{11+} + H_2 \rightarrow Br^{12+}$

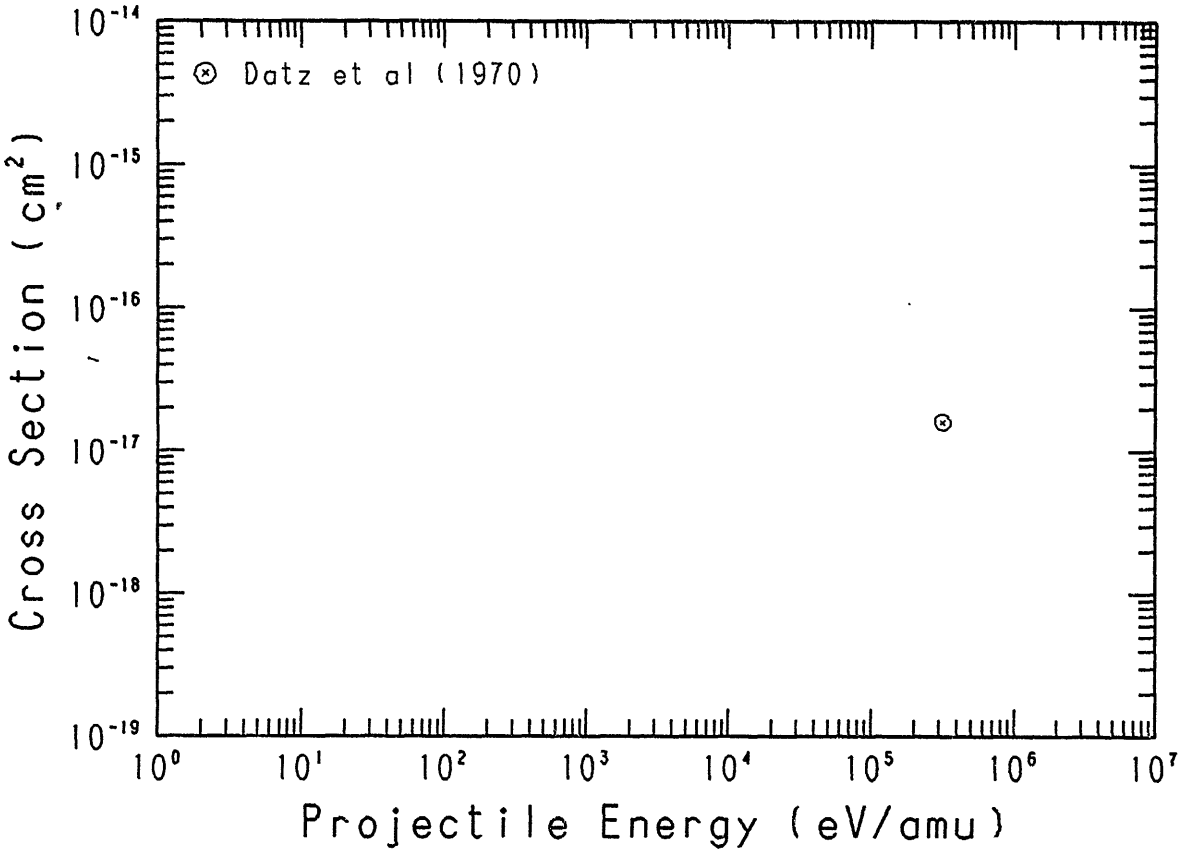


Fig. A38 $I^{2+} + H_2 \rightarrow I^{3+}$

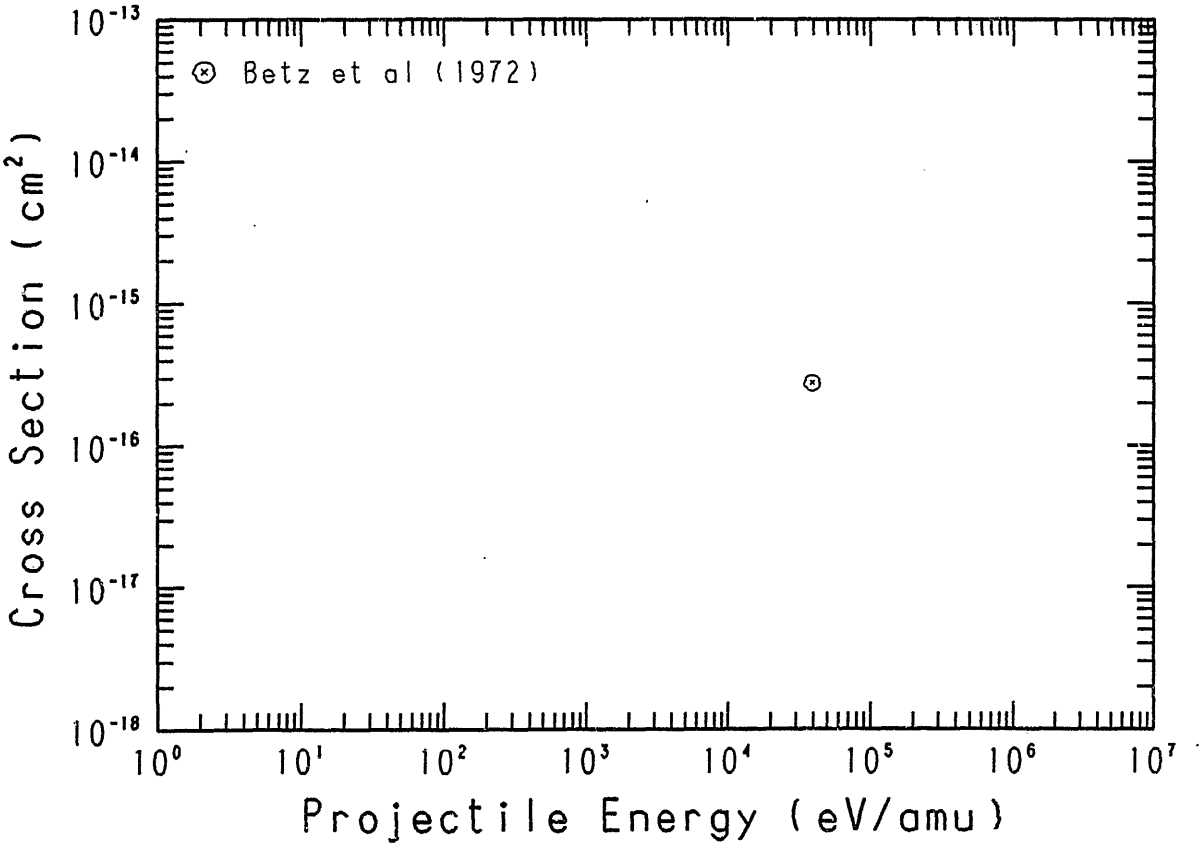


Fig. A39 $I^{2+} + H_2 \rightarrow I^{4+}$

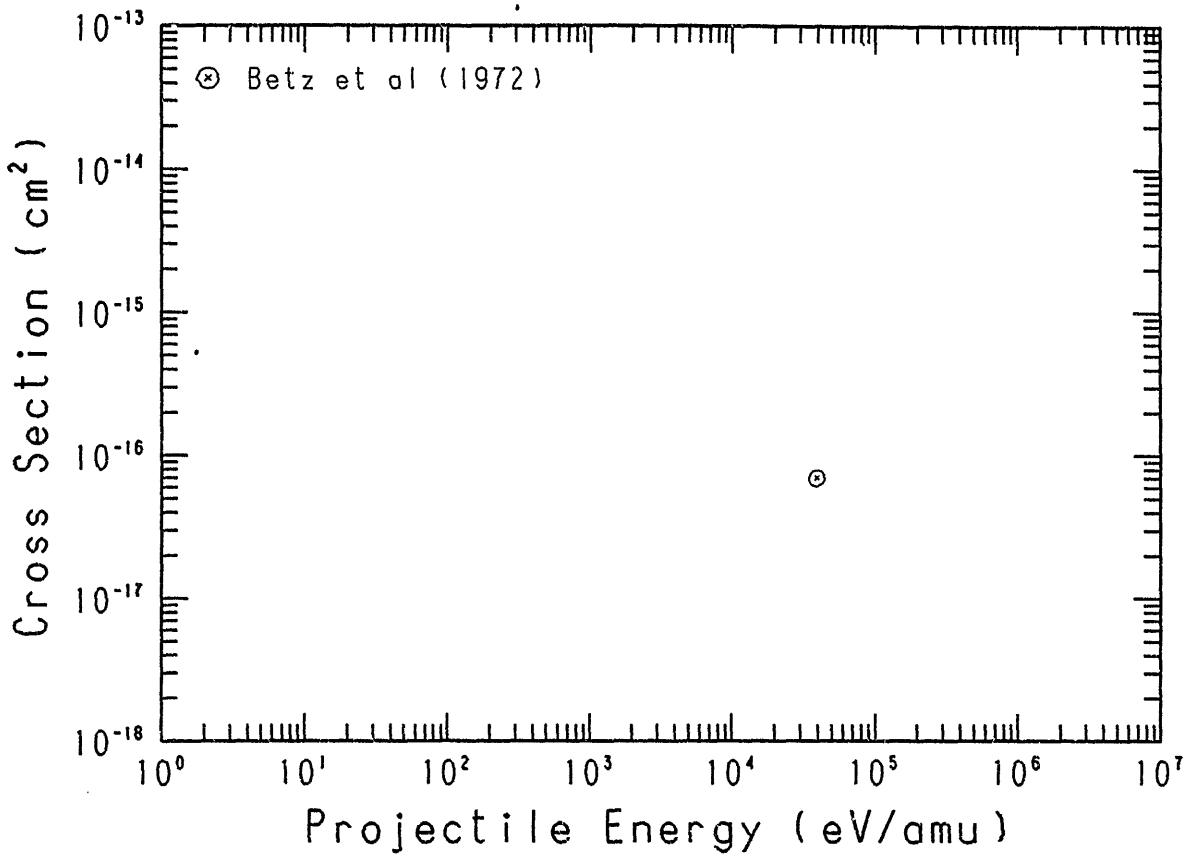


Fig. A40 $I^{2+} + H_2 \rightarrow I^{5+}$

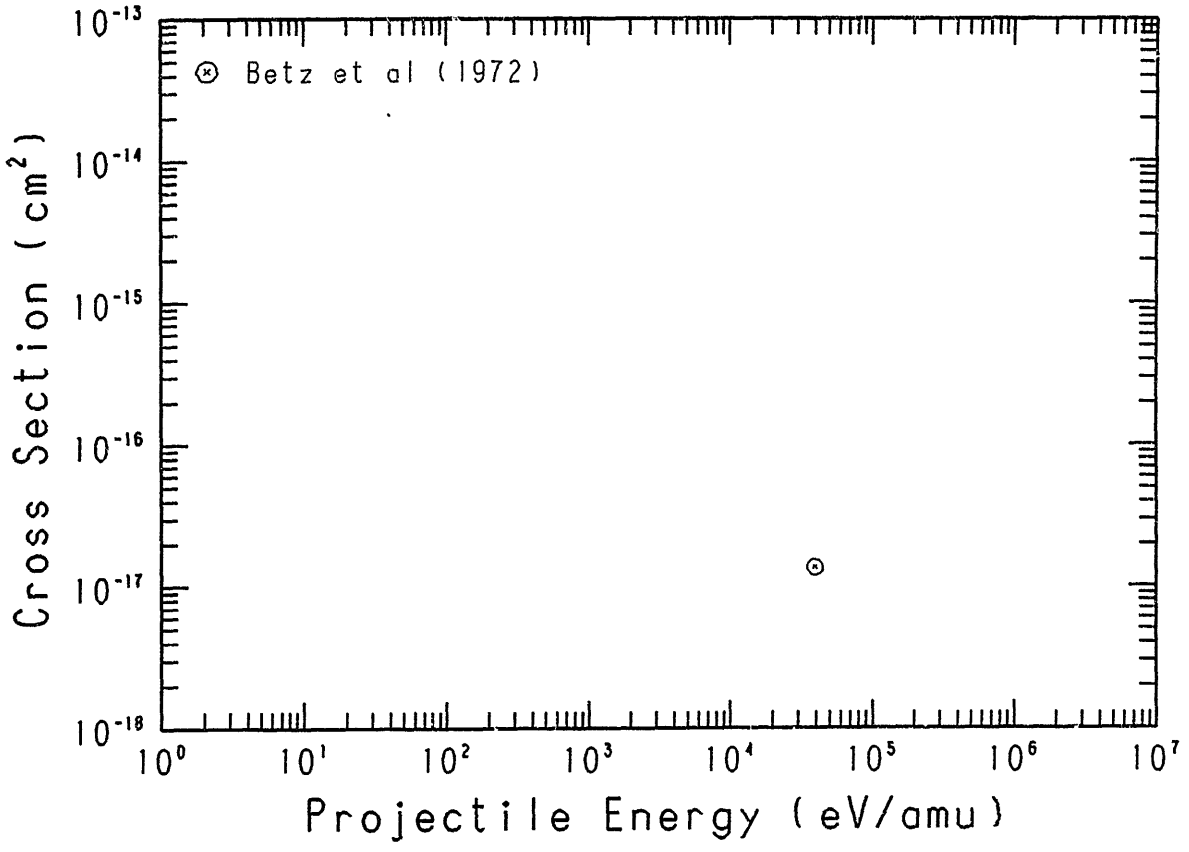


Fig. A41 $I^{3+} + H \rightarrow I^{4+}$

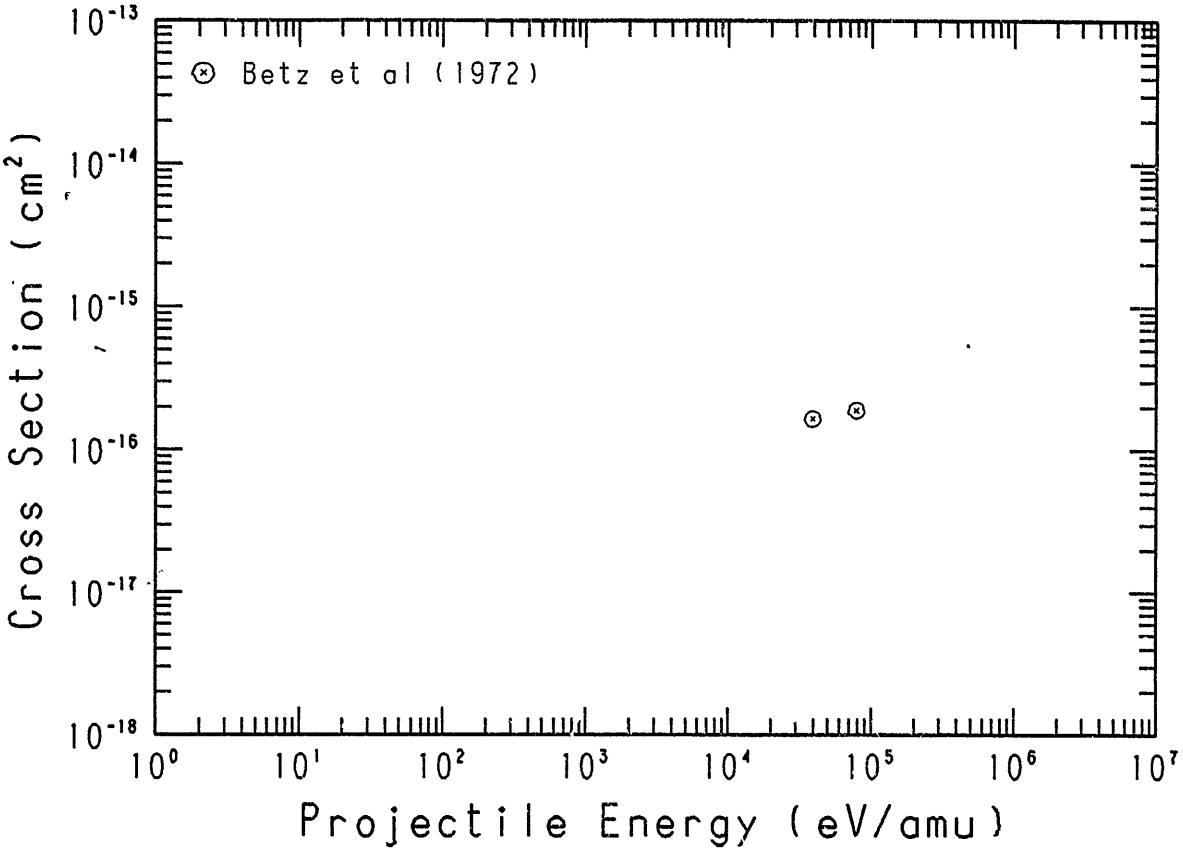


Fig. A42 $I^{3+} + H_2 \rightarrow I^{5+}$

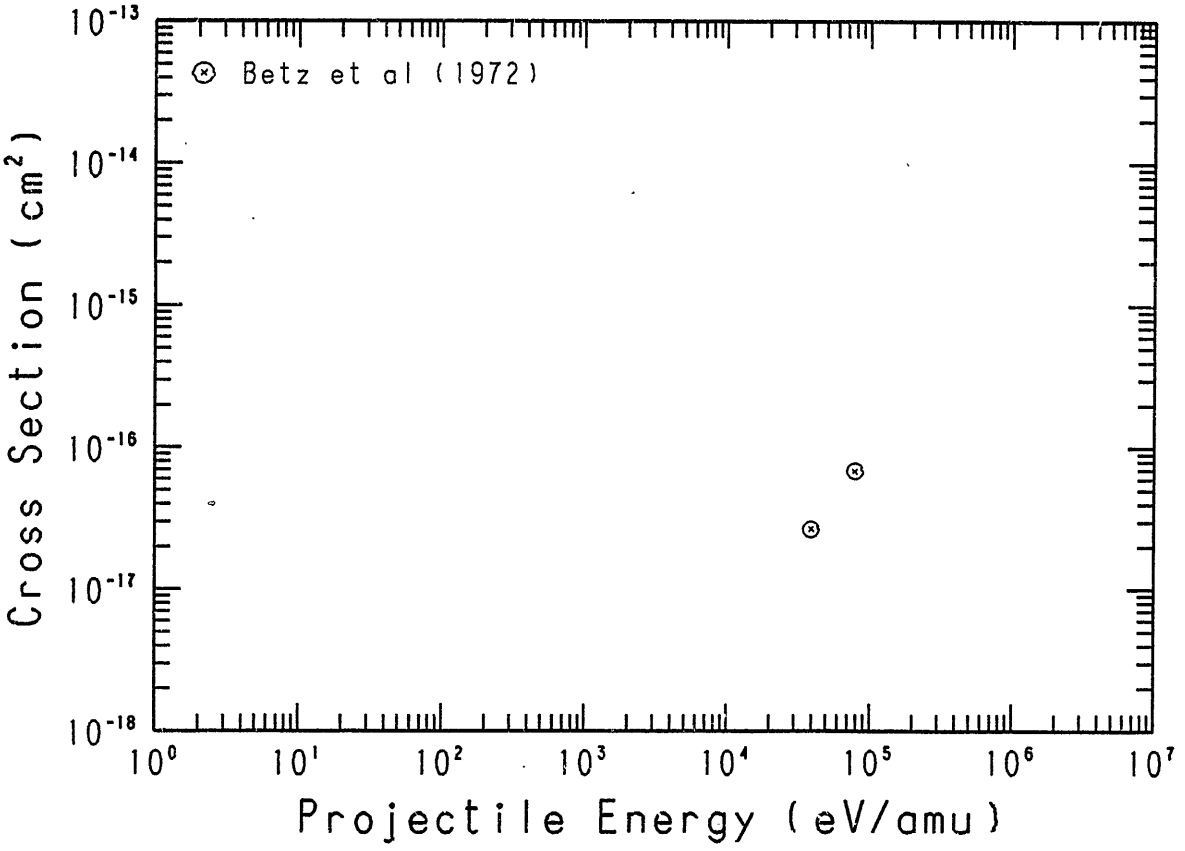


Fig. A43 $I^{3+} + H_2 \rightarrow I^{6+}$

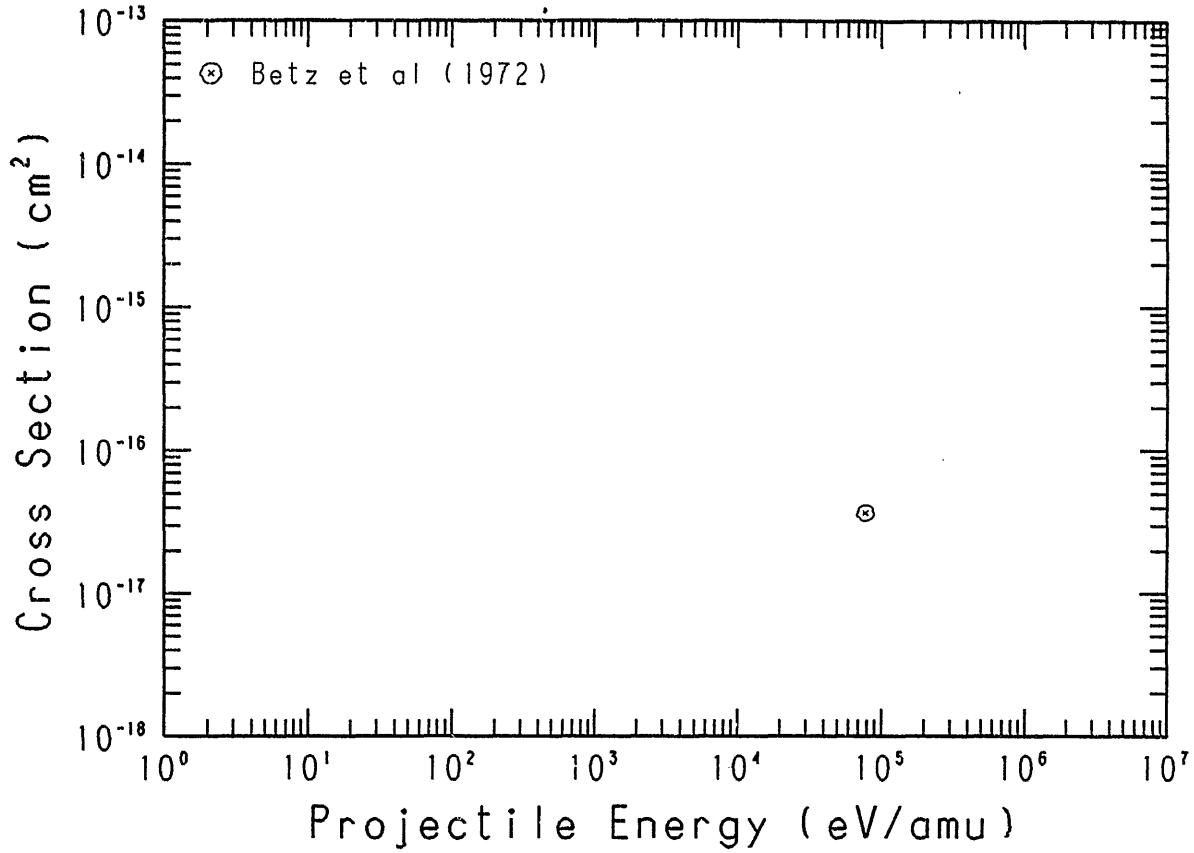


Fig. A44 $I^{4+} + H_2 \rightarrow I^{5+}$

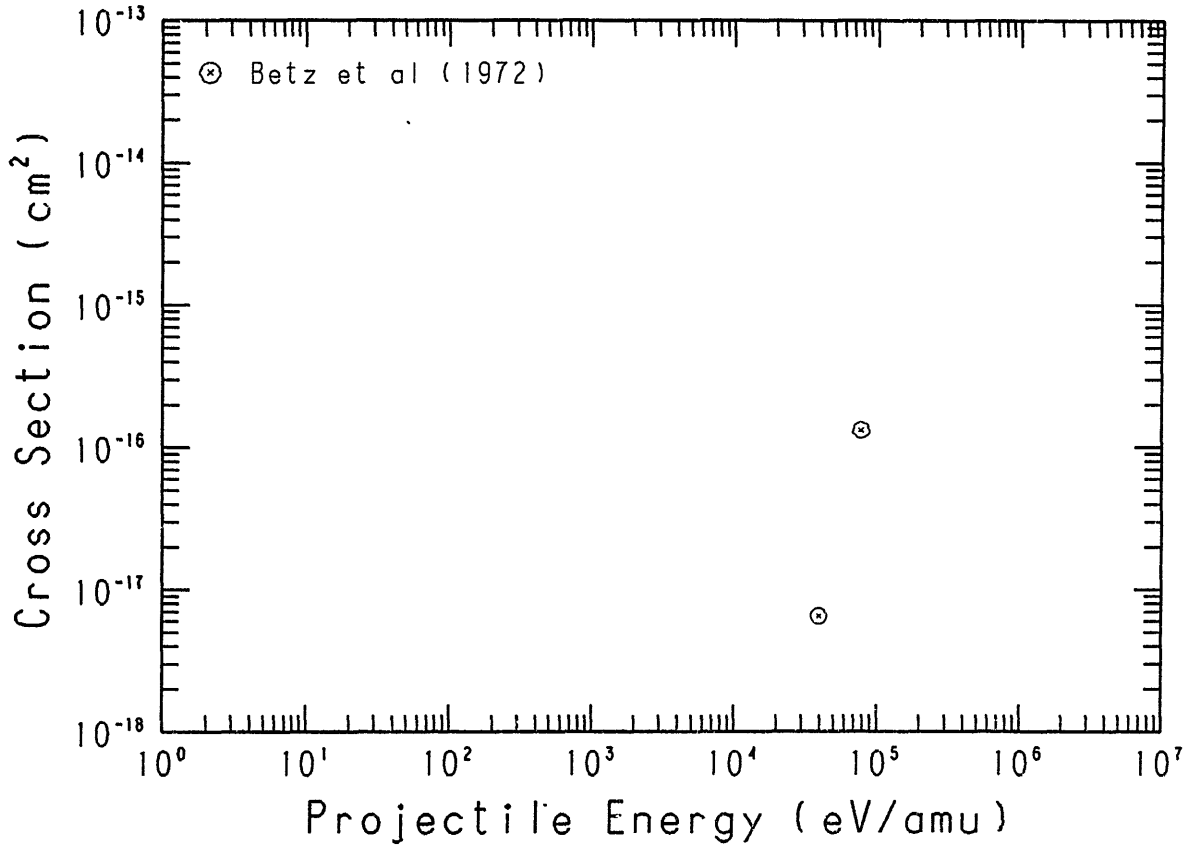


Fig. A45 $I^{4+} + H_2 \rightarrow I^{6+}$

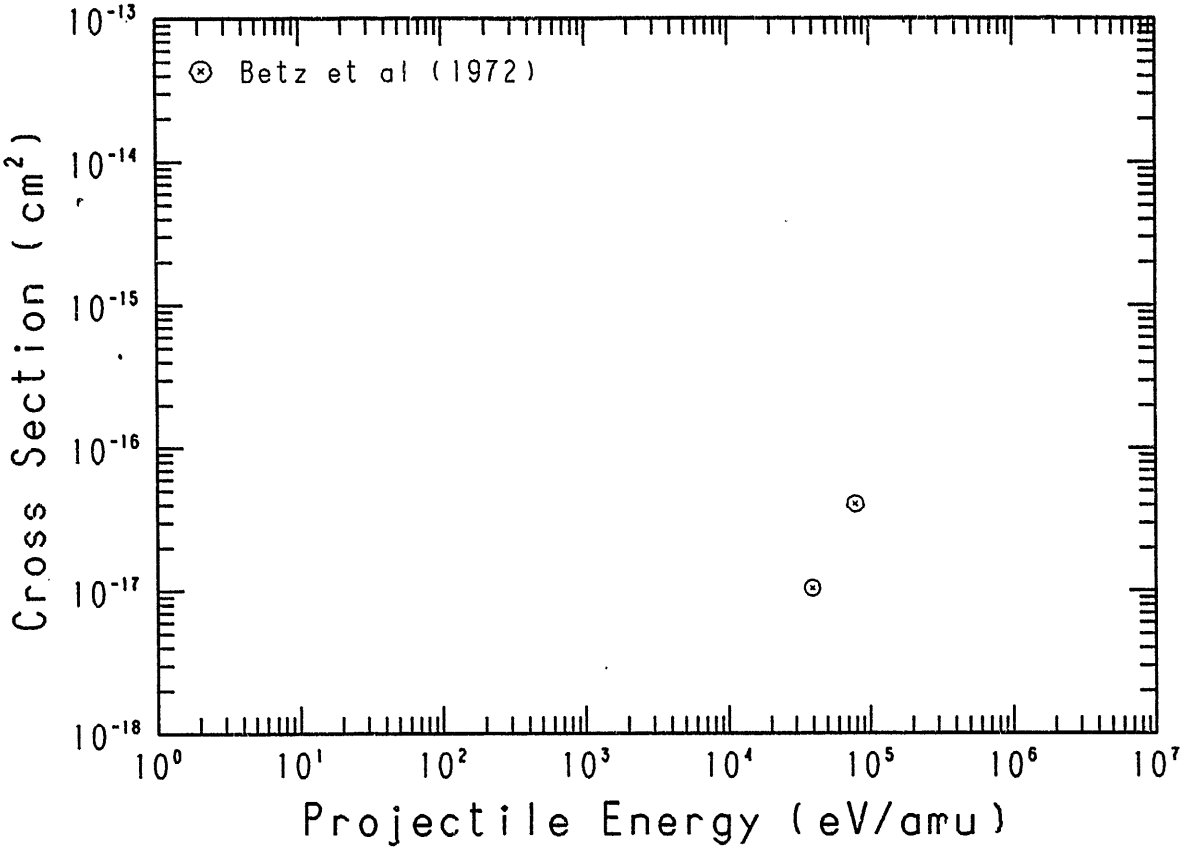


Fig. A46 $I^{4+} + H_2 \rightarrow I^{7+}$

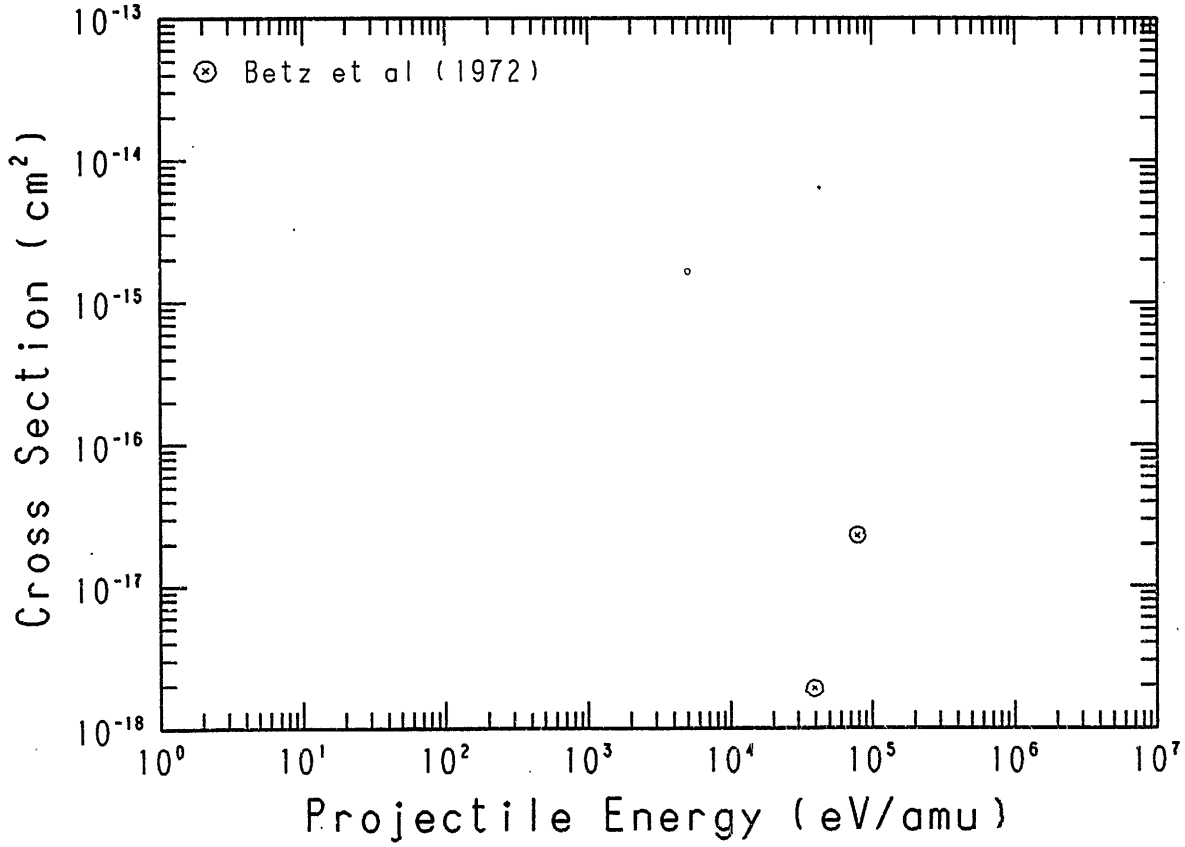


Fig. A47 $I^{5+} + H_2 \rightarrow I^{6+}$

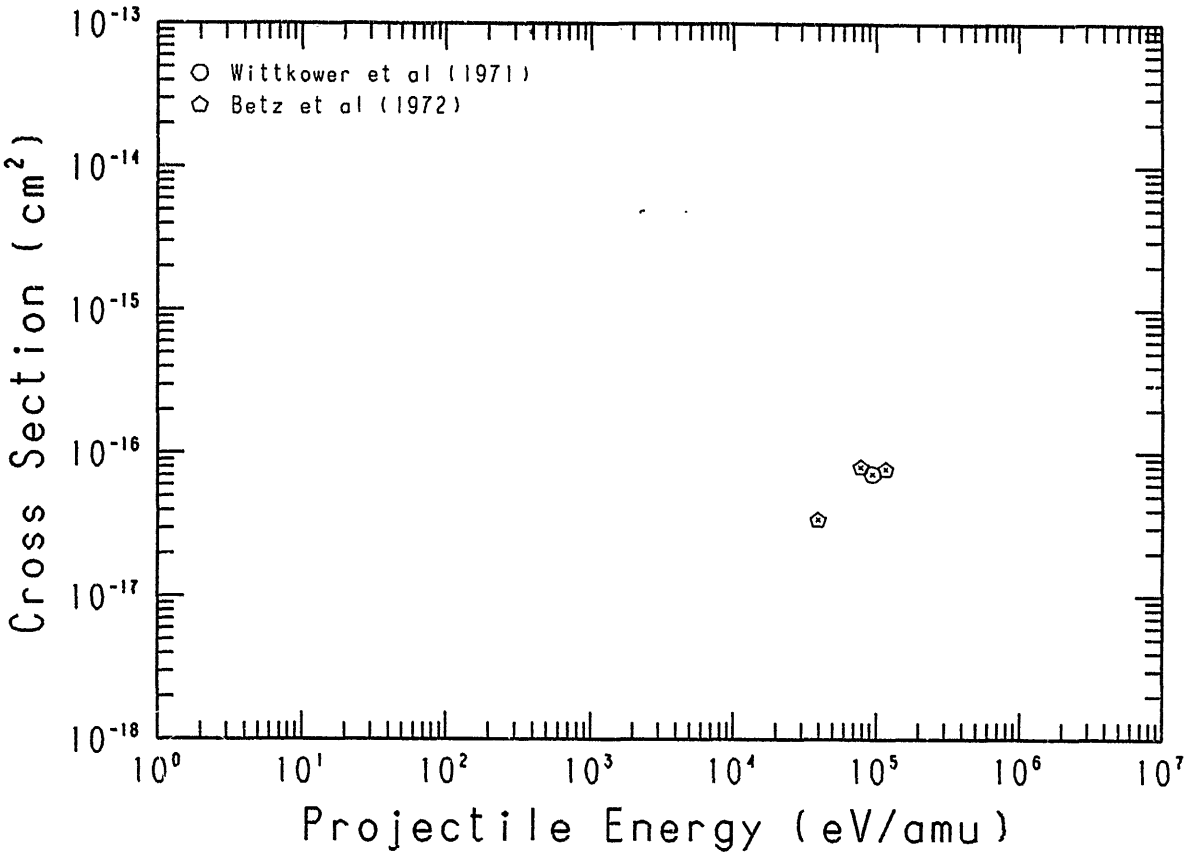


Fig. A48 $I^{5+} + H_2 \rightarrow I^{7+}$

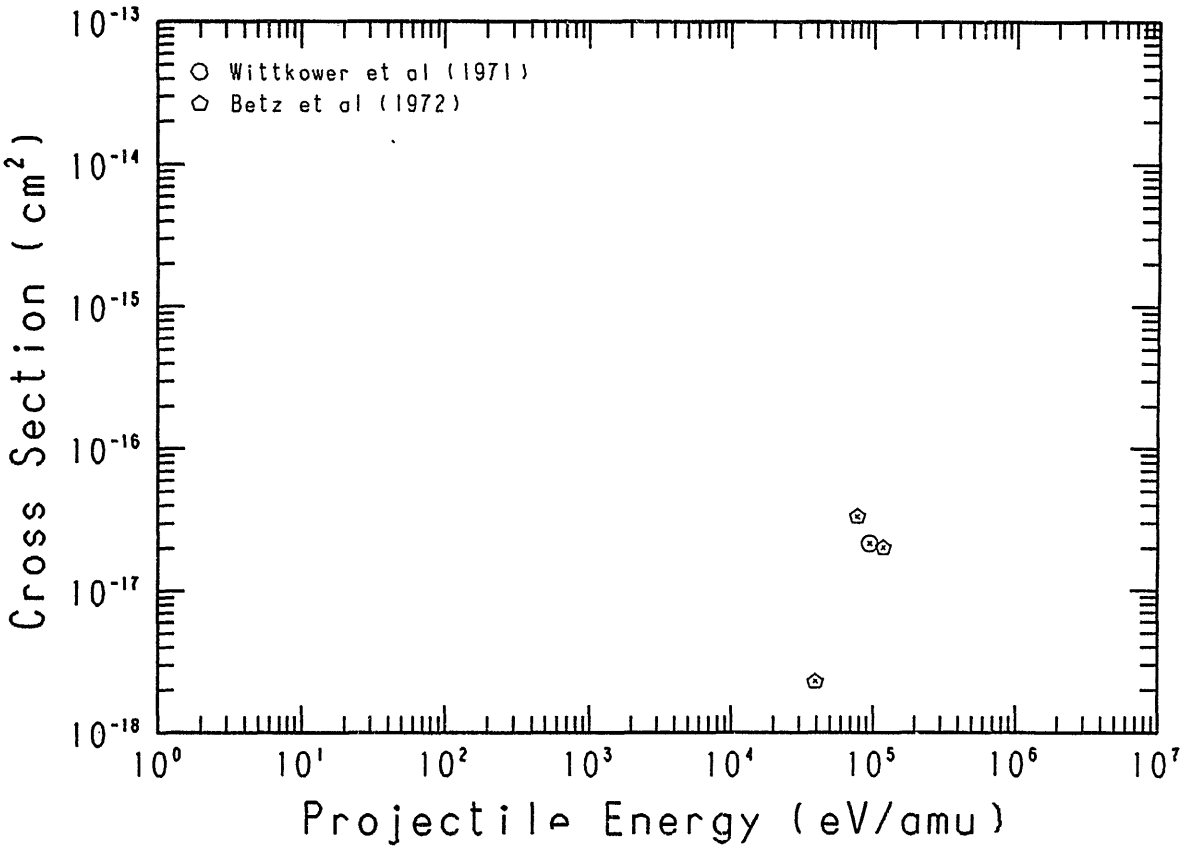


Fig. A49 $I^{5+} + H_2 \rightarrow I^{8+}$

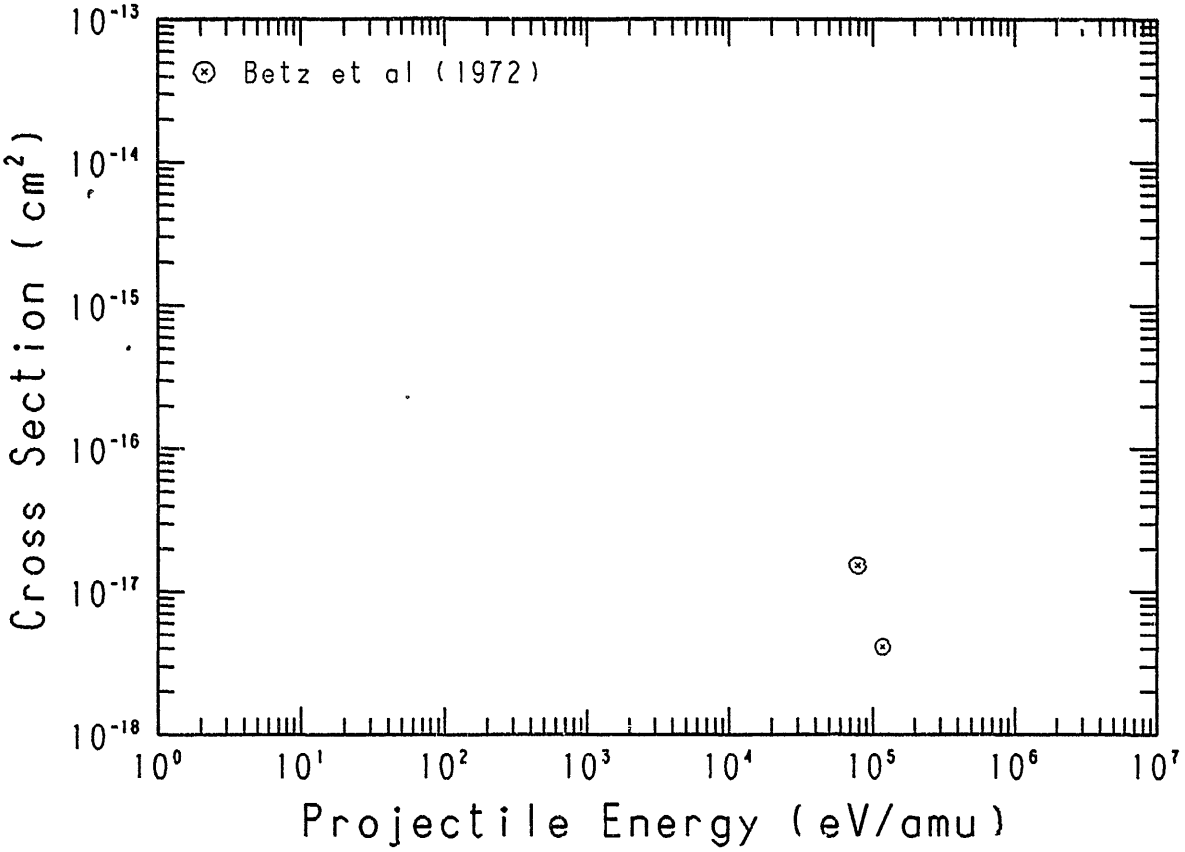


Fig. A50 $I^{6+} + H_2 \rightarrow I^{7+}$

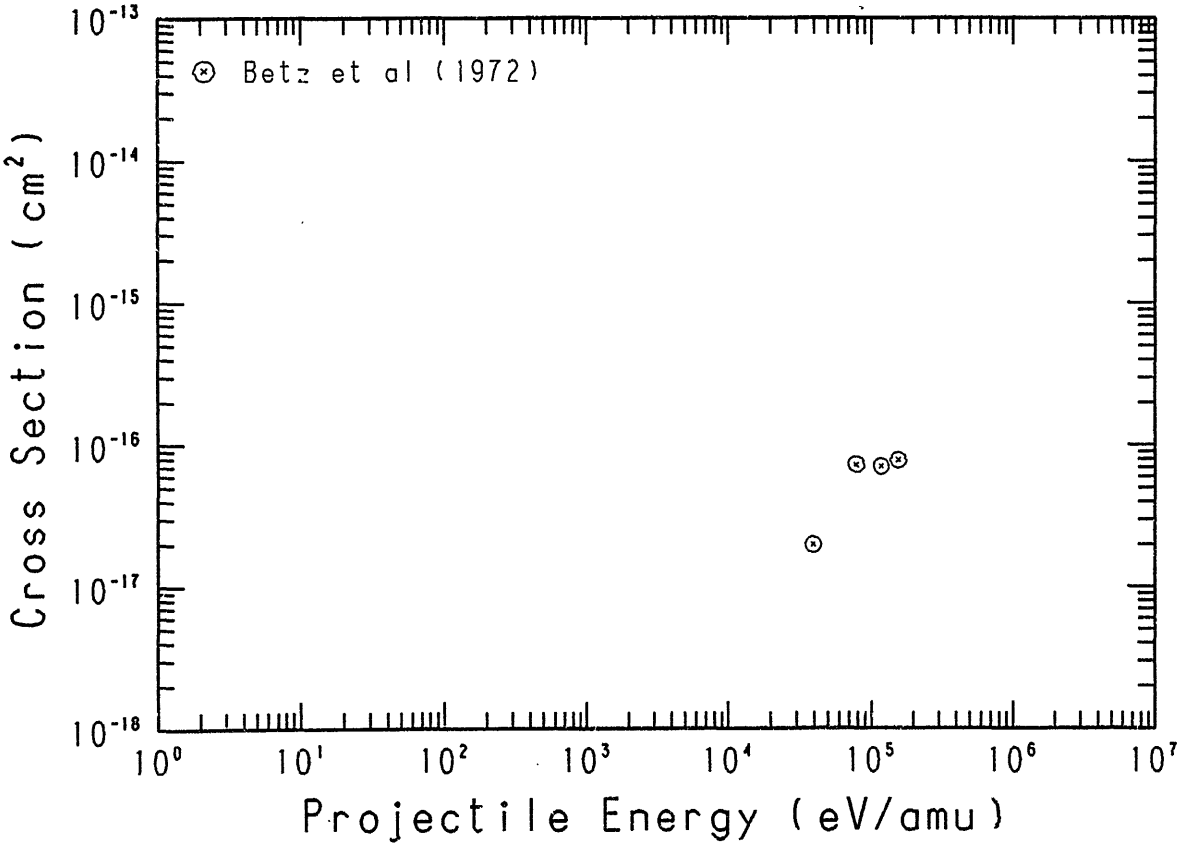


Fig. A51 $I^{6+} + H_2 \rightarrow I^{8+}$

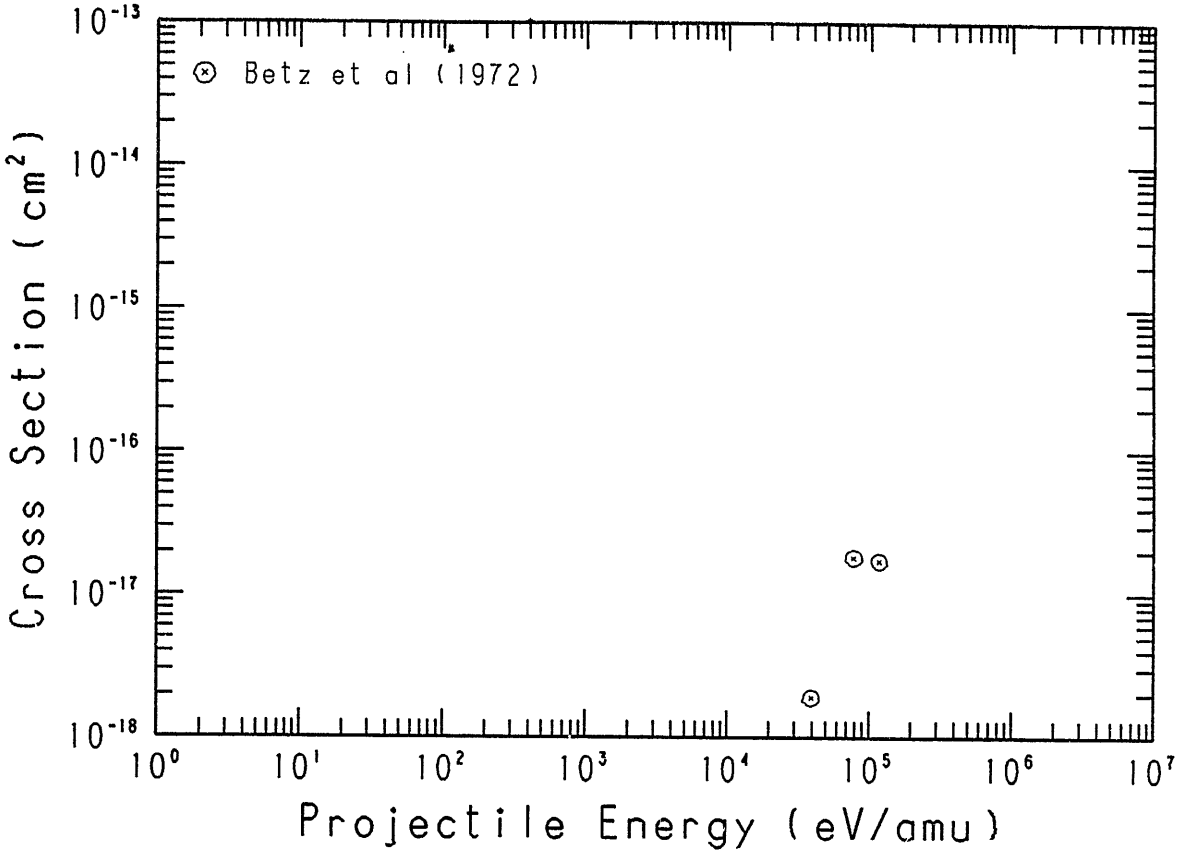


Fig. A52 $I^{6+} + H_2 \rightarrow I^{9+}$

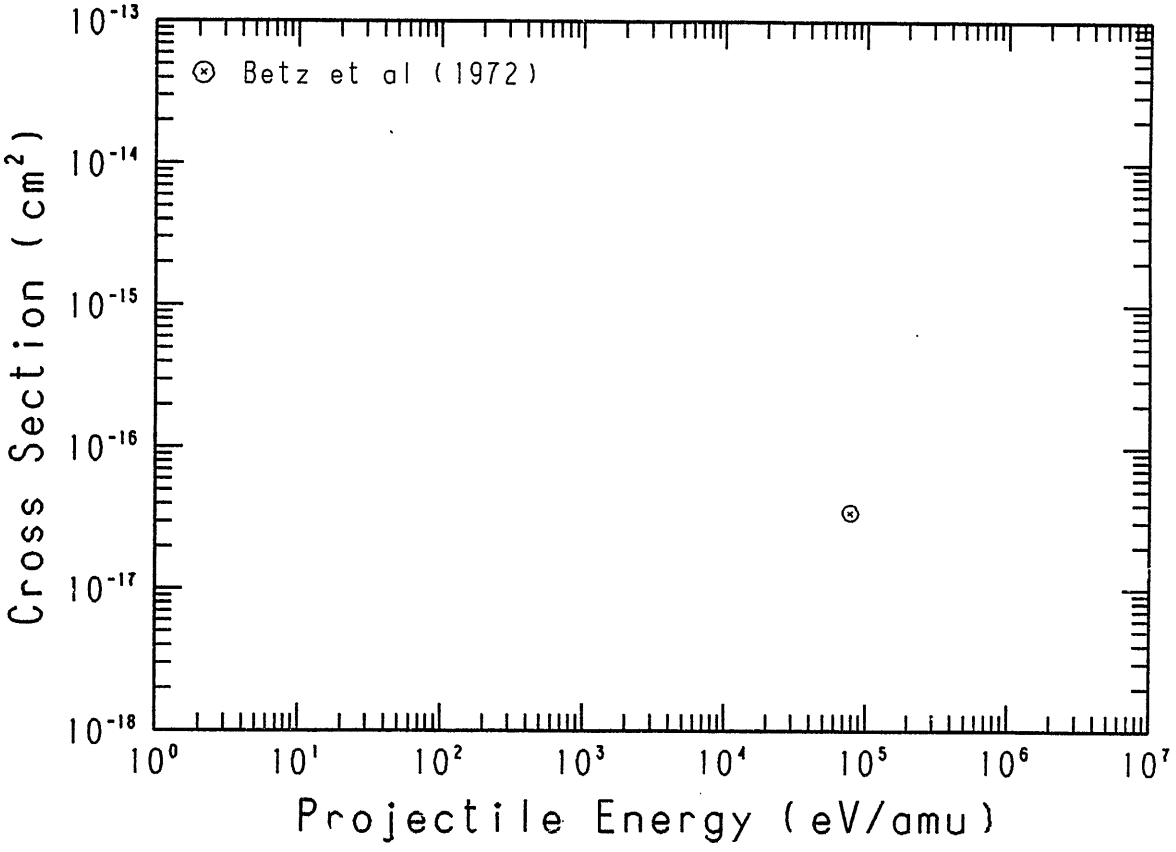


Fig. A53 $I^{7+} + H_2 \rightarrow I^{8+}$

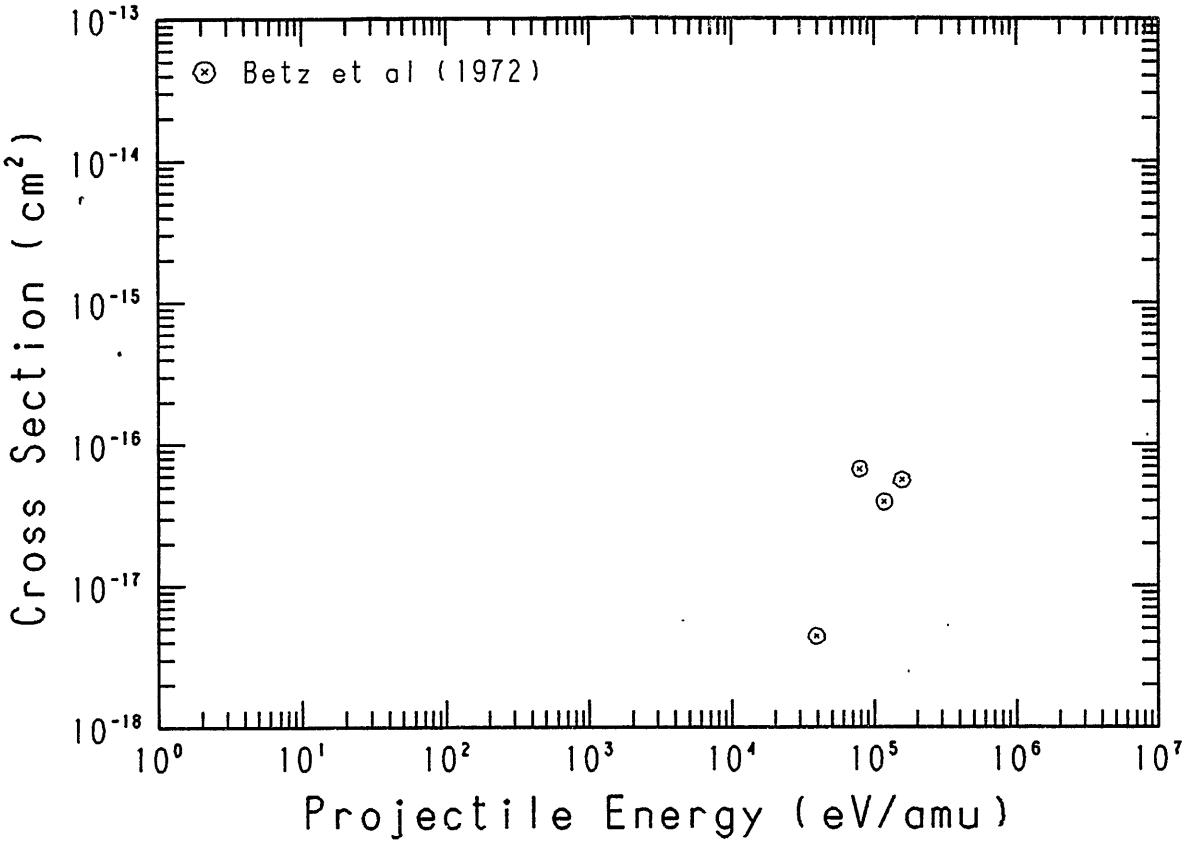


Fig. A54 $I^{7+} + H_2 \rightarrow I^{9+}$

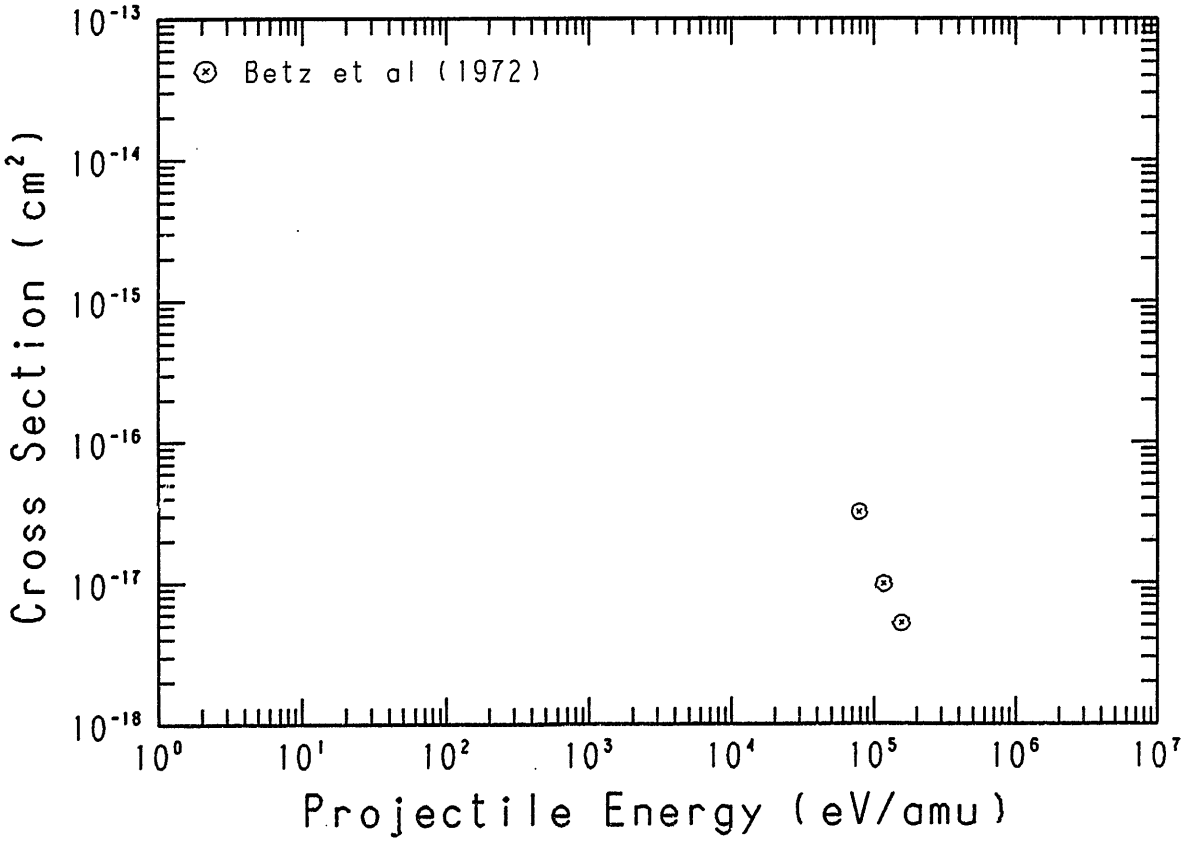


Fig. A55 $I^{8+} + H_2 \rightarrow I^{9+}$

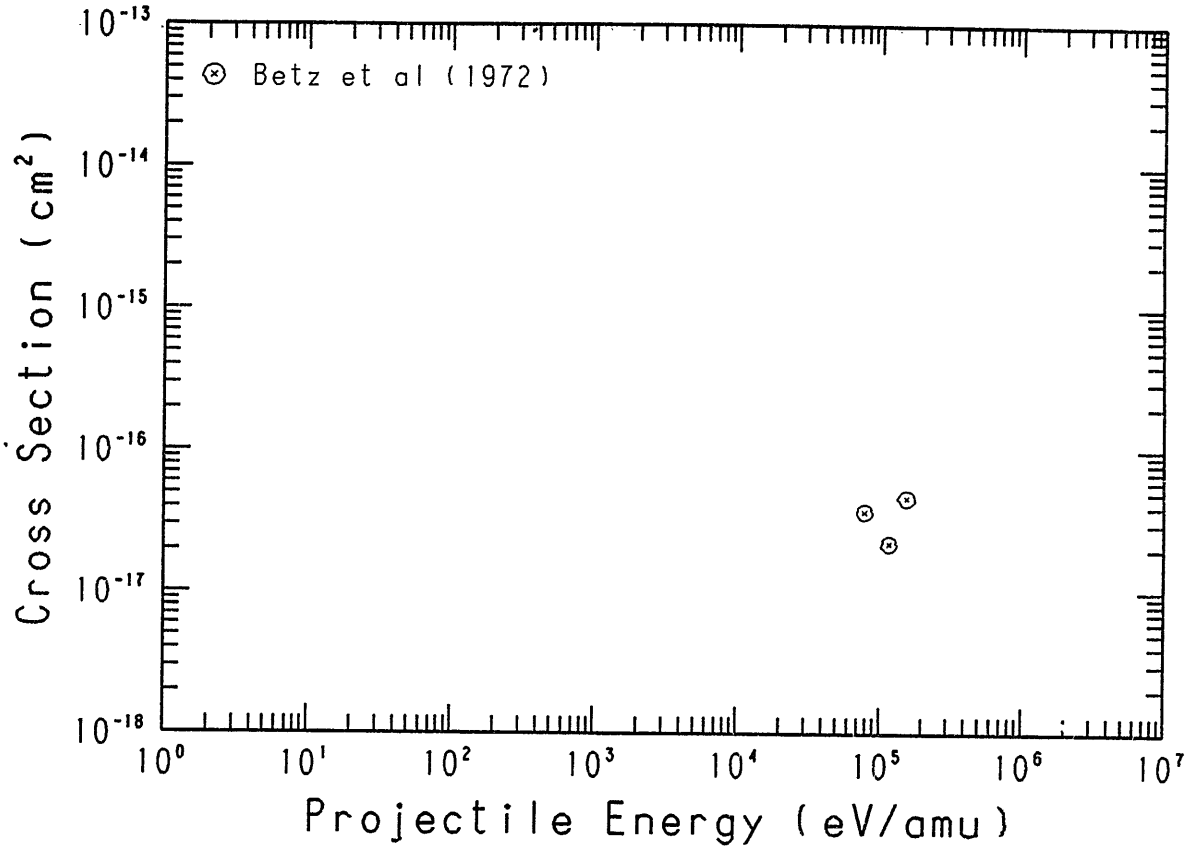


Fig. A56 $I^{8+} + H_2 \rightarrow I^{10+}$

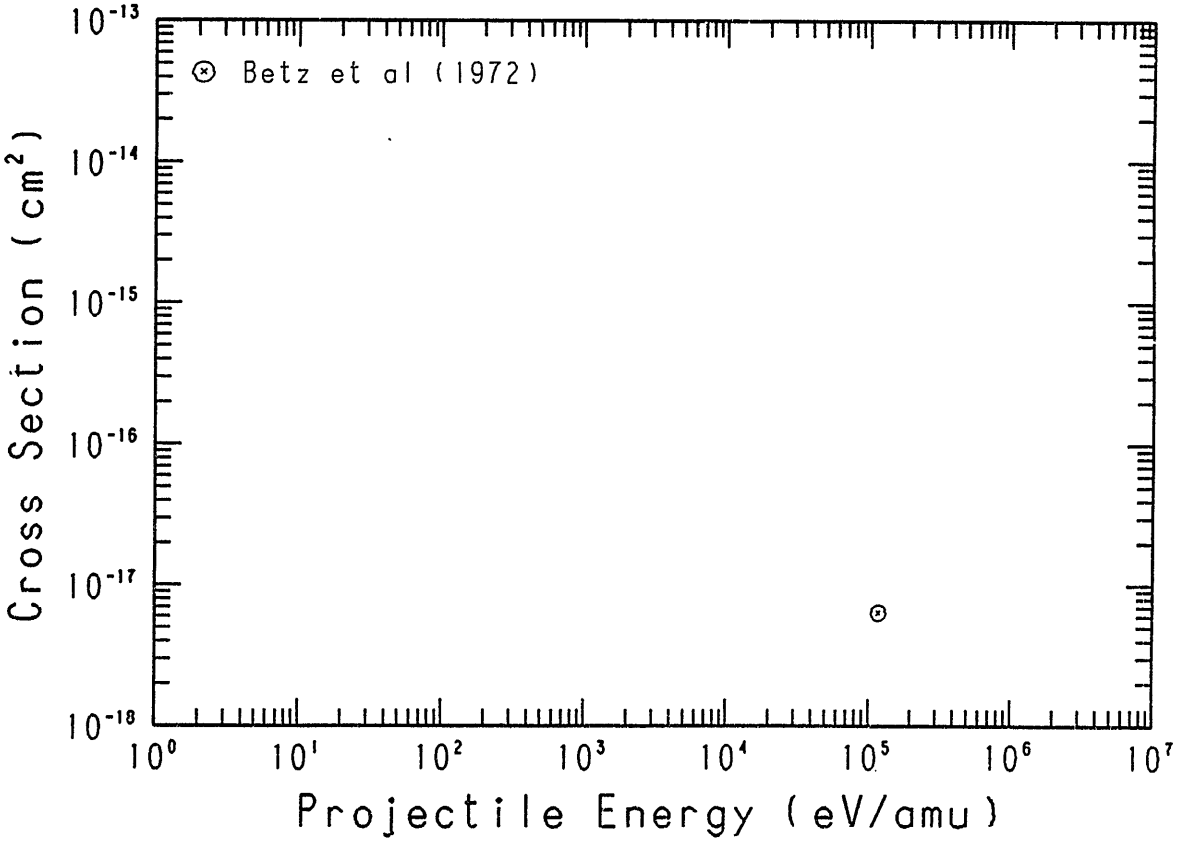


Fig. A57 $I^{9+} + H_2 \rightarrow I^{10}$

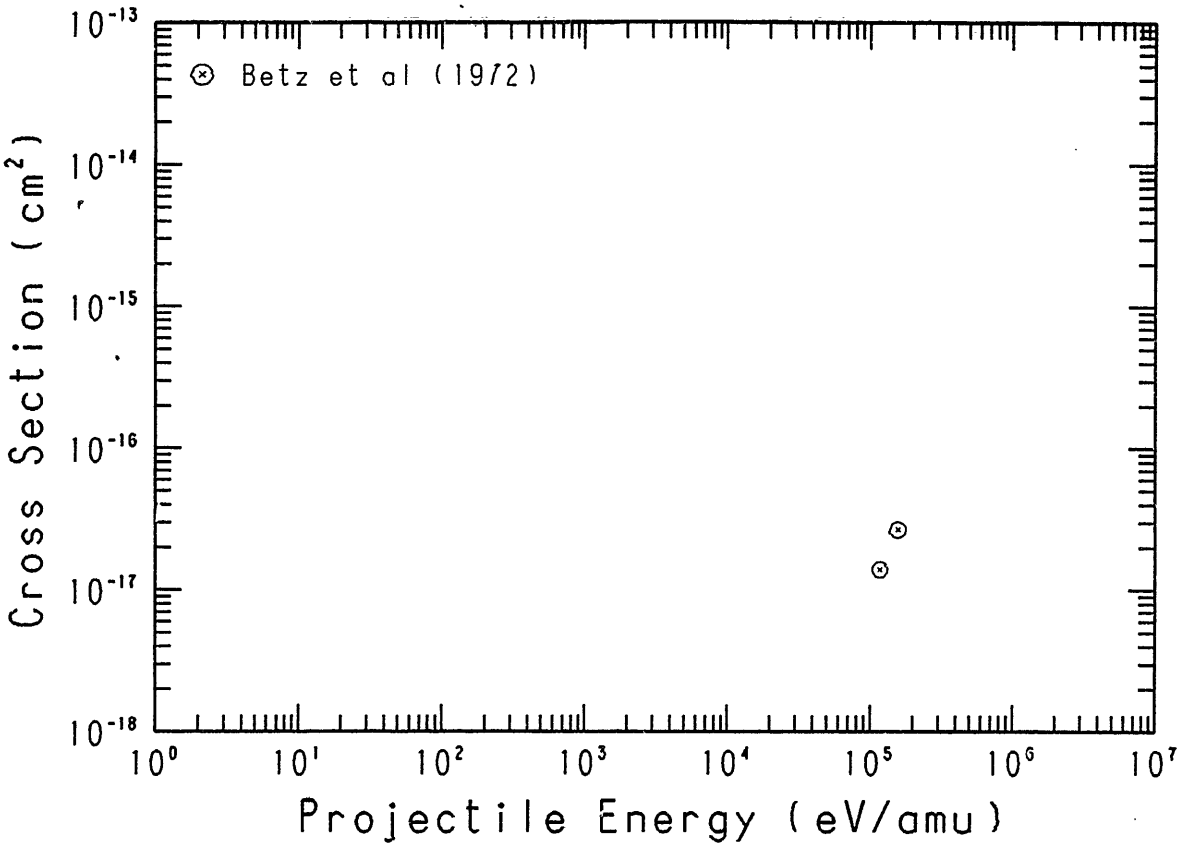
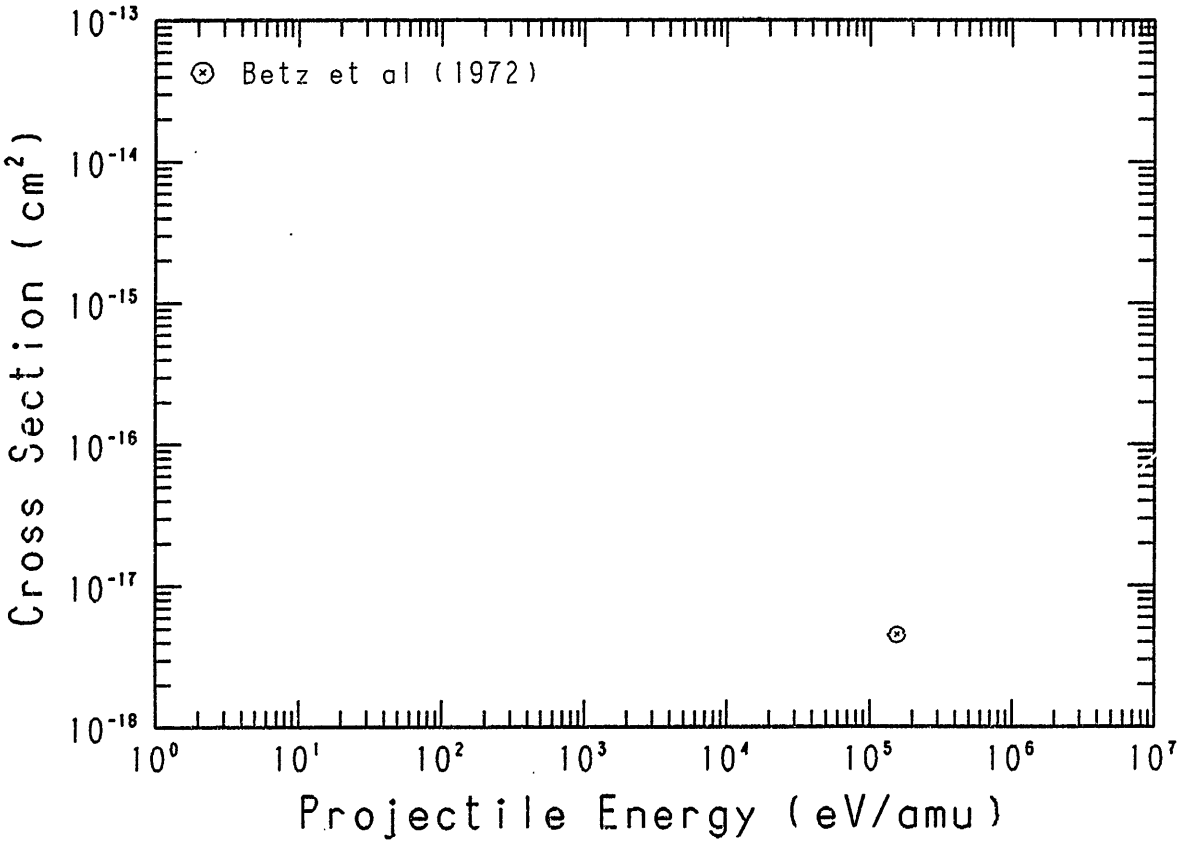
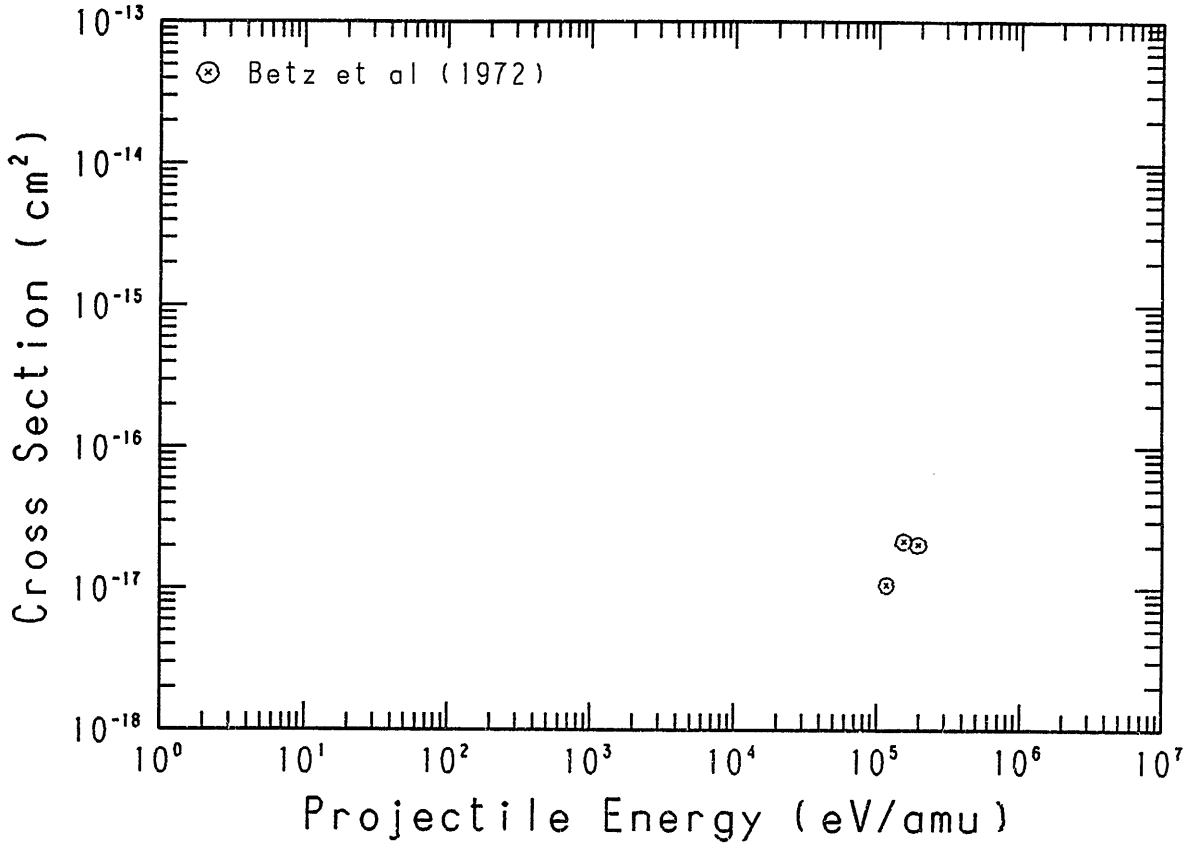


Fig. A58 $I^{9+} + H_2 \rightarrow I^{11+}$



Graph No. 19

Fig. A59 $I^{10+} + H_2 \rightarrow I^{11+}$



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IPPJ-AM-1* "Cross Sections for Charge Transfer of Hydrogen Beams in Gases and Vapors in the Energy Range 10 eV–10 keV"
by Tawara (1977)

IPPJ-AM-2* "Ionization and Excitation of Ions by Electron Impact –Review of Empirical Formulae–"
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IPPJ-AM-3 "Grotrian Diagrams of Highly Ionized Iron FeVIII-FeXXVI"
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IPPJ-AM-6* "Free-Free Transition in a Plasma –Review of Cross Sections and Spectra–"
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IPPJ-AM-7* "Bibliography on Electron Collisions with Atomic Positive Ions: 1940 Through 1977"
by K. Takayanagi and T. Iwai (1978)

IPPJ-AM-8 "Semi-Empirical Cross Sections and Rate Coefficients for Excitation and Ionization by Electron Collision and Photoionization of Helium"
by T. Fujimoto (1978)

IPPJ-AM-9 "Charge Changing Cross Sections for Heavy-Particle Collision in the Energy Range from 0.1 eV to 10 MeV I. Incidence of He, Li, Be, B and Their Ions"
by Kazuhiko Okuno (1978)

IPPJ-AM-10 "Charge Changing Cross Sections for Heavy-Particle Collision in the Energy Range from 0.1 eV to 10 MeV II. Incidence of C, N, O and Their Ions"
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IPPJ-AM-11 "Charge Changing Cross Sections for Heavy-Particle Collision in the Energy Range from 0.1 eV to 10 Mev III. Incidence of F, Ne, Na and Their Ions"
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IPPJ-AM-12* "Electron Impact Excitation of Positive Ions Calculated in the Coulomb-Born Approximation –A Data List and Comparative Survey–"
by S. Nakazaki and T. Hashino (1979)

IPPJ-AM-13 "Proceedings of the Nagoya Seminar on Atomic Processes in Fusion Plasmas Sept. 5-7, 1979" (1979)

IPPJ-AM-14 "Energy Dependence of Sputtering Yields of Monatomic Solids"
N. Matsunami, Y. Yamamura, Y. Itikawa, N. Itoh, Y. Kazumata, S. Miyagawa, K. Morita and R. Shimizu (1980)

IPPJ-AM-15 "Cross Sections for Charge Transfer Collisions Involving Hydrogen Atoms"
Y. Kaneko, T. Arikawa, Y. Itikawa, T. Iwai, T. Kato, M. Matsuzawa, Y. Nakai, K. Okuno, H. Ryufuku, H. Tawara and T. Watanabe (1980)

IPPJ-AM-16 "Two-Centre Coulomb Phaseshifts and Radial Functions"
by H. Nakamura and H. Takagi (1980)

IPPJ-AM-17 "Empirical Formulas for Ionization Cross Section of Atomic Ions for Electron Collisions –Critical Review with Compilation of Experimental Data–"
by Y. Itikawa and T. Kato (1981)

IPPJ-AM-18 "Data on the Backscattering Coefficients of Light Ions from Solids"
T. Tabata, R. Ito, Y. Itikawa, N. Itoh and K. Morita (1981)

IPPJ-AM-19 "Recommended Values of Transport Cross Sections for Elastic Collision and Total Collision Cross Section for Electrons in Atomic and Molecular Gases"
M. Hayashi (1981)

IPPJ-AM-20 "Electron Capture and Loss Cross Sections for Collisions between Heavy Ions and Hydrogen Molecules"
Y. Kaneko, Y. Itikawa, T. Iwai, T. Kato, Y. Nakai, K. Okuno and H. Tawara (1981)

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