International Atomic Energy Agency

EXFOR for Stellar Evolution Study Through α-Induced Reaction

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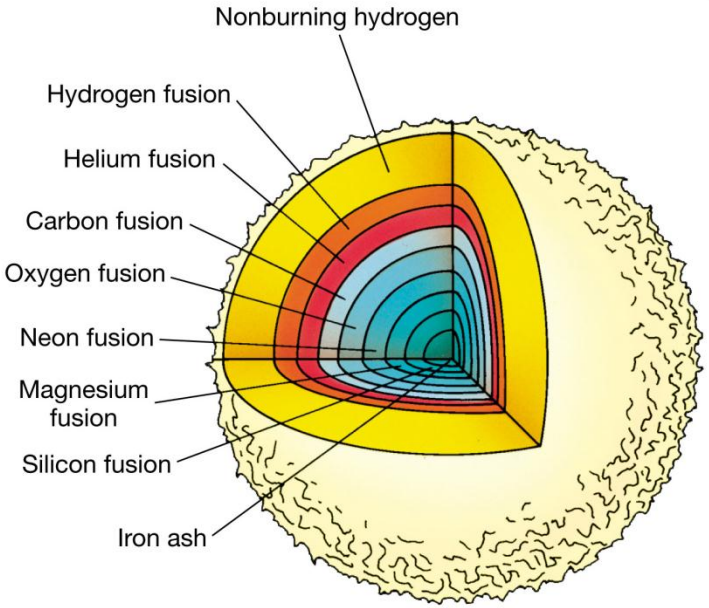
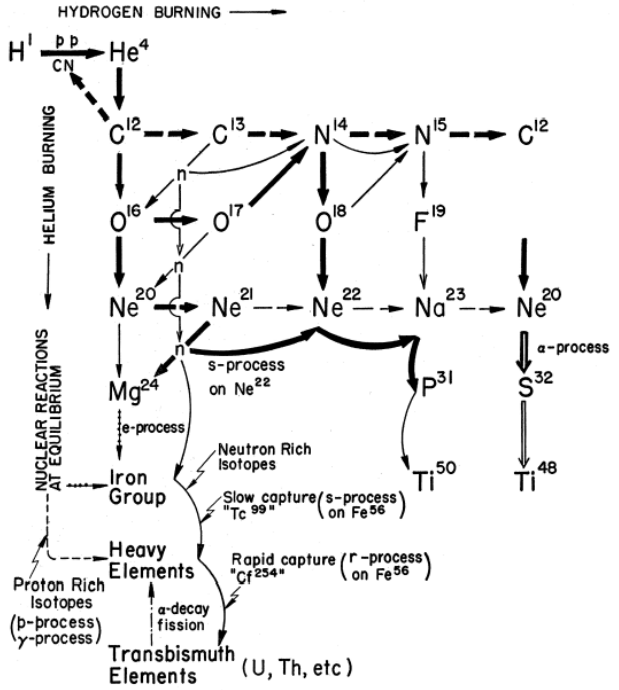
IAEA Nuclear Data Section

α-Burning in Red Giants

Alpha-induced reactions likes (α,γ), (α,n), (α,p) at low energies play an important role in stellar evolution.





E. M. Burbidge et al., (B^2FH) Rev.Mod.Phys.29(1957)

Review of α-Induced Reaction Data

Peter Mohr (Germany/ATOMKI) has intensively reviewed such alpha-induced reactions with EXFOR.

His review article for alpha-induced reactions with 34 target nuclides (A~20 to 50) was submitted to Eur. Phys.J. A.

Cross sections of α-induced reactions for targets with masses $A \approx 20 - 50$ at low energies

Peter Mohr[1,2a]

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[2] Institute for Nuclear Research ATOMKI, H-4001 Debrecen, Hungary

"Availability of experimental data" (Draft of Section 3.7)

"Fortunately, nowadays many experimental data are provided by the EXFOR database [29] which is a ***great facilitation for a literature overview***. However, it has to be kept in mind that the quality of the data in EXFOR depends sensitively on the data source. Newer data are often provided by the authors of the experimental paper. For earlier papers the original data are only available if the data are listed in a table in the paper (or in an underlying thesis or laboratory report; however, the latter are often not easily accessible). If original data are not available, the EXFOR editors have often re-digitized experimental data from figures. In such cases significant uncertainties arise from the digitization procedure which may exceed the experimental uncertainties of the original data. This holds in particular for small figures in logarithmic scale."

(Peter Mohr, submitted to Eur. Phys. J. A)

Tabulated Data Provided from Peter (Now Digitized Data in EXFOR)

ELSEVIER

Nuclear Physics A 574 (1994) 397–413

NUCLEAR PHYSICS A

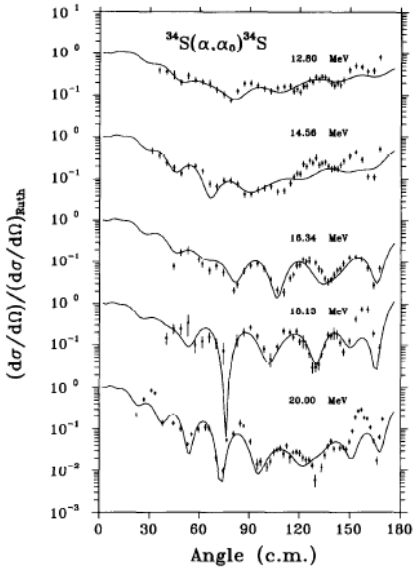
Low-energy elastic-scattering of alpha particles from ^{34}S, ^{50}Cr and ^{62}Ni

Å. Bredbacka [a,1], M. Brenner [a], K.-M. Källman [a], P. Manngård [a], Z. Máté [b], S. Szilágyi [b], L. Zolnai [b]

[a] *Department of Physics, Åbo Akademi, 20500 Åbo, Finland*

[b] *Institute of Nuclear Research of the Hungarian Academy of Sciences, H-4001 Debrecen Pf. 51, Hungary*

Received 26 May 1993; revised 12 November 1993



Recently Dr. Zoltan Máté kindly provided data published in 1994 (via Peter Mohr).

The tabulated data set was sent to CNPD in February 2015 to replace digitized data in EXFOR F0461.

Good Interaction between Centre and User

P. Mohr often provides useful feedback on EXFOR.

From: WidmaierMohr@t-online.de
To: OTSUKA, Naohiko
Cc:
Subject: (a,X) data for A=20-50 nuclei
Message | mak_a-n_redig.dat (2 KB) | a20-50_rev.pdf (2 MB)

noticed during my work.

A0509001: 29Si(a,n), Flynn:
The cross sections below about 3.6 MeV are scaled by a factor of 10 in the figure by Flynn (not taken into account in EXFOR).

C0180001: 27Al(a,n), Howard:
The given data are from Holmqvist, Phys. Scr. 33, 107 (1986). The 27Al(a,n) data by Howard are not available in EXFOR.

F0638001: 24Mg(a,n), Gruhle:
The energy in EXFOR is the excitation energy in the compound nucleus 28Si (as shown in the figure by Gruhle), not E_alpha.

21Ne(a,n)24Mg:
The data of Mak et al., NPA 226, 493 (1974) are missing. Attached please find my re-digitization.

His Comment (20 April 2015)

A0509.007: 29Si(a,n), Flynn:

The cross sections below about 3.6 MeV are scaled by a factor of 10 in the figure by Flynn (not taken into account in EXFOR).

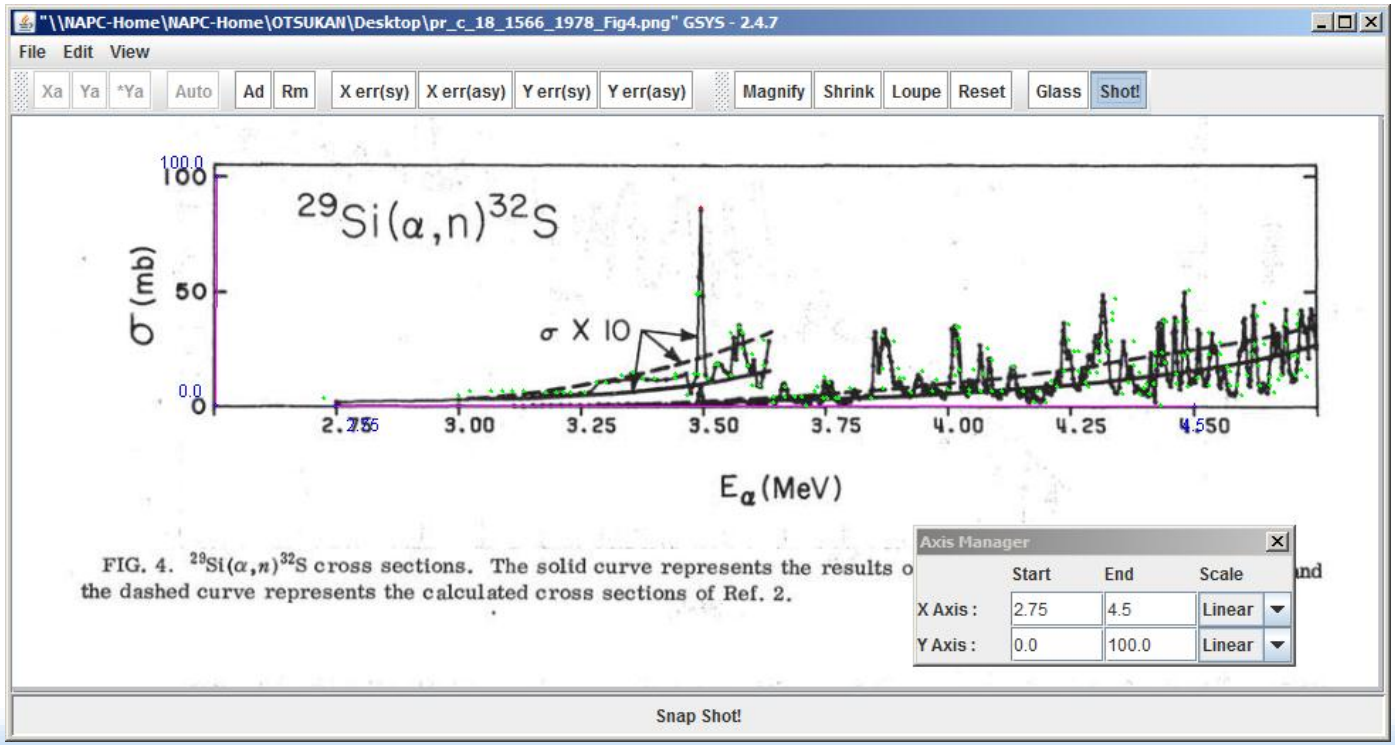
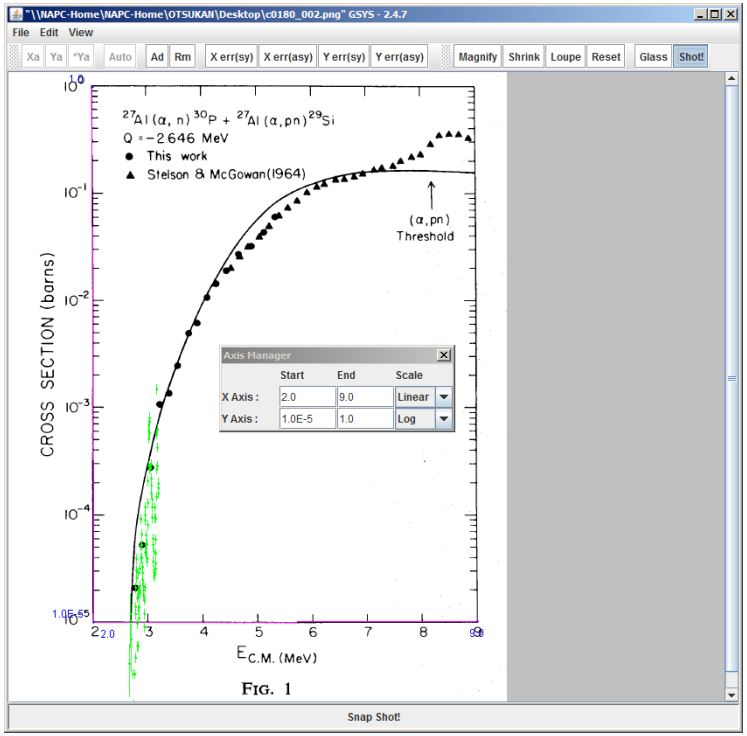


FIG. 4. $^{29}Si(\alpha,n)^{32}S$ cross sections. The solid curve represents the results o nd the dashed curve represents the calculated cross sections of Ref. 2.

His Comment (20 April 2015) - Cont

C0180.002: 27Al(a,n), Howard:

The given data are from Holmqvist, Phys. Scr. 33, 107 (1986). The 27Al(a,n) data by Howard are not available in EXFOR.

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SUBENT         C0180002
BIB                 4          7
REACTION    ((13-AL-27(A,N)15-P-30,,SIG)+
            (13-AL-27(A,N+P)14-SI-29,,SIG))
SAMPLE      Aluminum foils 0.025 cm thick.
ERR-ANALYS  (DATA-ERR1) Uncertainty in cross section scale.
            (DATA-ERR2) No information on source of
uncertainty
             given in NACRE file.
STATUS      (NACRE)
ENDBIB              7
COMMON              1          3
DATA-ERR1
PER-CENT
 15.
ENDCOMMON           3
DATA                3        106
EN-CM       DATA        DATA-ERR2
MEV         B           B
2.655           4.1E-06     2.1E-06
2.672           1.2E-05     6.2E-06
```

His Comment (20 April 2015) - Cont

EXFOR. F0638: 24Mg(a,n), Gruhle:

The energy in EXFOR is the excitation energy in the compound nucleus 28Si (as shown in the figure by Gruhle), not E_alpha.

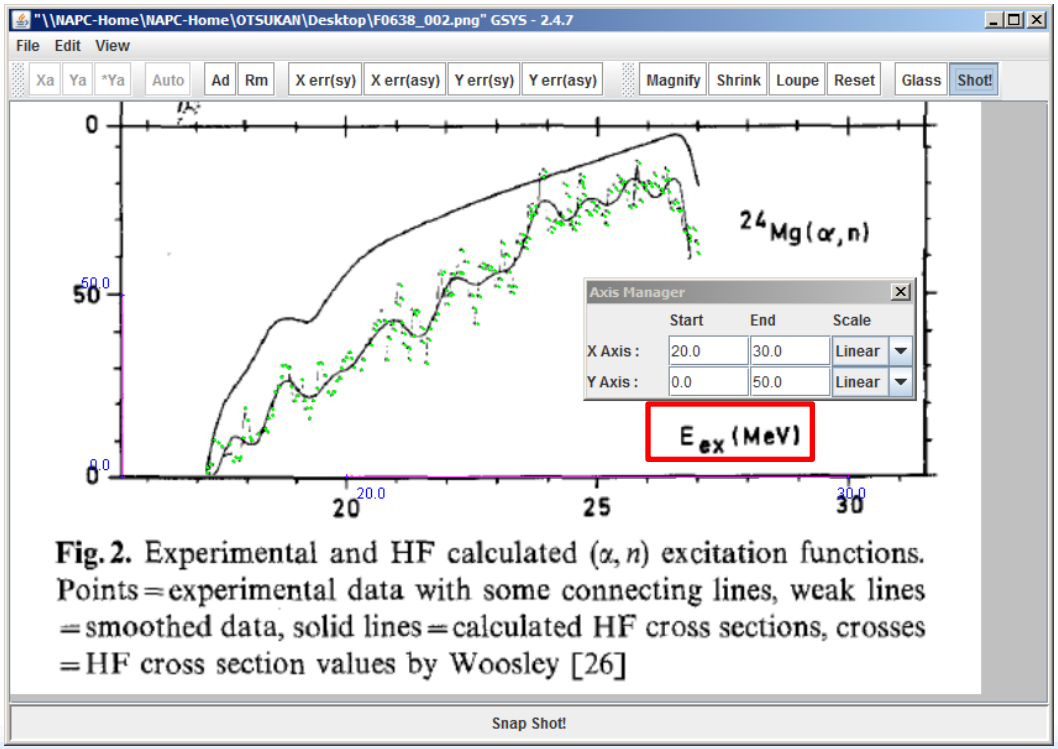

Fig. 2. Experimental and HF calculated (α, n) excitation functions. Points = experimental data with some connecting lines, weak lines = smoothed data, solid lines = calculated HF cross sections, crosses = HF cross section values by Woosley [26]

This is now easily solved by using the new heading E-EXC-CMP (excitation Energy of compound).

His Comment (20 April 2015) - Cont

21Ne(a,n)24Mg:

The data of Mak et al., NPA 226, 493 (1974) are missing.
Attached please find my re-digitization.

(Yes, this US work is actually missing in EXFOR. I checked the data digitized by him against the original figure. It will be sent to NNDC for area C compilation.)

Thank You for Your Attention

We will be also acknowledged at the end of Peter's review article …