Evaluation of γ-production cross sections of neutron induced reactions in Si

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Basing on the statistical model γ-production cross sections were calculated using the code STAPRE /1/. Applying a consistent set of parameters found for description of particle channels /2/ γ-emission parameters (strength functions, GDR parameters) have been adjusted using experimental data available at present.

By this procedure, γ-emission cross sections for ^{28,29} and ^{30}Si resulting from (n,γ), (n,nγ), (n,αγ), (n,pγ) and (n,2nγ) reactions have been obtained and compared to measured values.

The agreement is very satisfactory for excitation functions of discrete γ-transitions (fig. 1), the γ-production cross section (fig. 2) and γ-ray spectra (fig. 3). The accuracy of the predicted (n,γ) cross sections can't be criticized because of a terrible deficiency of measurements (fig. 4).

In all cases available recommended data were also included in this study presented at the Xth Int. Symposium in Gaussig /4/.

References

/1/   M. Uhl, B. Strohmaier, Report IRK-76/01, 1976

/2/   D. Hermsdorf, L. Neumann, Proc. IXth Int. Symp., Gaussig, 1979, Report ZfK-410, 1980, 147

/3/   V. Benzi et al., Report RT/FI (69) 44, 1969

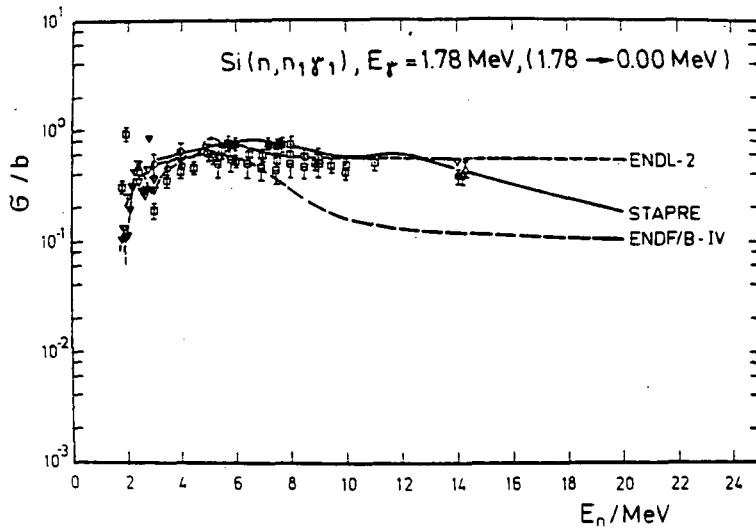/4/   D. Hermsdorf, E. Paffrath, Proc. X[th] Int. Symp. Gaussig, 1980, in press

Fig. 1 · Excitation function for the emission of 1.78 MeV γ-quanta resulting from the $2_1^+ \rightarrow 0_1^+$ transition in ^{28}Si.
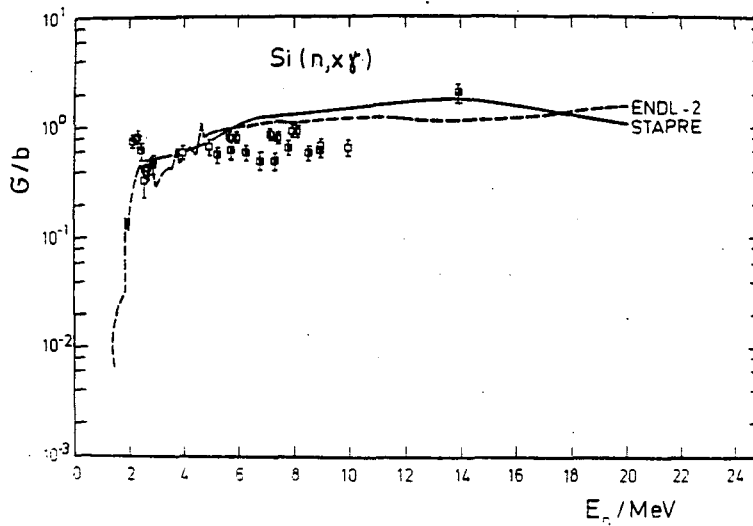

Fig. 2 Excitation function of the γ-production cross section of natural Si.

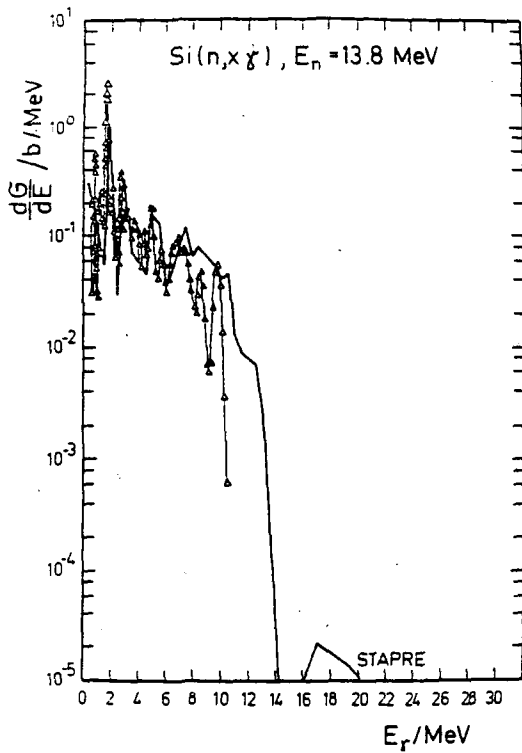Fig. 3 Spectrum of γ-quanta
emitted by natural
Si following nuclear
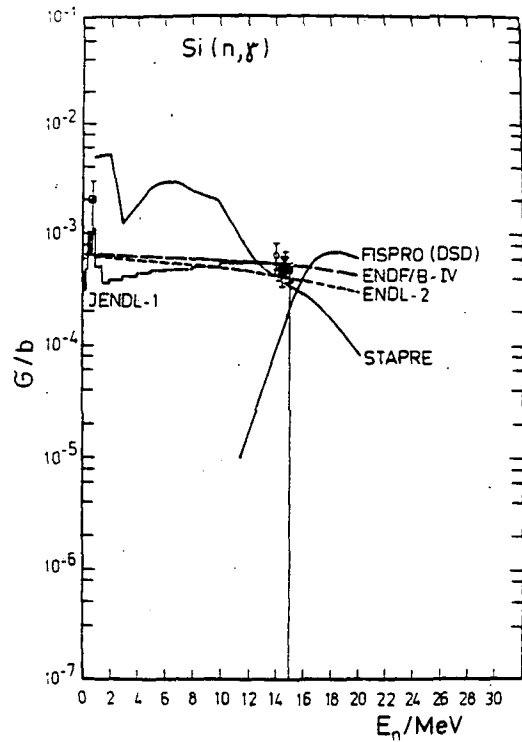reactions induced by
13.8 MeV neutrons.

Fig. 4 Neutron capture cross
section for natural Si.
A contribution from the
direct-semidirect model
has been obtained using
the code FISPRO /3/.