

D. NUCLEAR REACTIONS

D1 Deexcitation Gamma Rays from Residual Nuclei in the Photodesintegration of ^{40}Ca

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Analysis of photonuclear reactions with respect to the population of residual nuclei levels can give important information concerning the composition of the giant resonance states. Cases in which residual nuclei have appropriate level schemes are especially suited for such investigations. Recently the photodesintegration of ^{16}O was studied^{1,2)} in detail, and an experiment on calcium reported³⁾. The aim of the present work on calcium was to obtain information on processes involved at different energies.

Calcium was irradiated with bremsstrahlung of maximum energies from 15 to 31.5 MeV. The spectrum of gamma rays escaping from the calcium target was measured with a 20 cm³ Ge(Li) detector at 135° during 80 μs X-ray bursts from the betatron. Annihilation radiation from the 0.9 s decay of the ^{39}Ca was detected in the intervals between the bursts. Simultaneously, photoproton spectra were taken from a separate calcium target with silicon detectors at four different angles.

Gamma ray lines corresponding to transitions from the excited states of ^{39}K 2.53 MeV ($1/2^+$), 2.82 MeV ($7/2^-$), 3.02 MeV ($3/2^+$) as well as from the 2.47 MeV ($1/2^+$) state of ^{39}Ca could be identified. Proton groups in connection with these states were observed to have predominantly symmetric angular distributions. Preliminary results indicate that the photodesintegration in most cases involves the ground state of the residual nucleus but the contribution of the first excited state is also appreciable. Evaluation of branching ratios as a function of energy is in progress for comparison with the results of theoretical calculations.

References

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- 3) H. Ullrich and H. Krauth, Nucl. Phys. A123 (1968) 641.

D2 Radiative Capture of 14 MeV Neutrons

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Over the last few years a technique for measuring 14 MeV neutron γ -ray spectra integrated over solid angle 4π has been developed and measurements

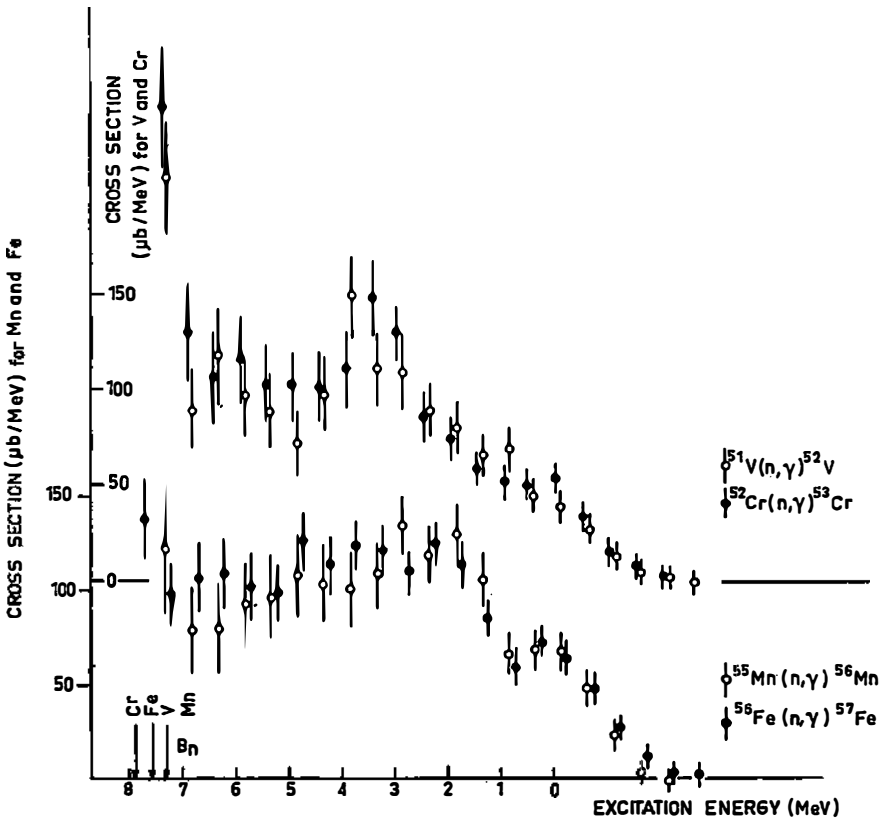


Fig. 1

made for some light and medium-weight nuclei. The spectra range from about 14 MeV to 22 MeV and represent the transitions to the bound states of final nuclei. Due to poor (12%) experimental resolution, the spectra exhibit only a