

PHOTONUCLEAR CROSS SECTIONS OF U-233
USING NEUTRON CAPTURE GAMMA RAYS, NEAR THRESHOLD.

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ABSTRACT

The photofission and photoneutron cross sections for U-233 have been studied using monochromatic and discrete photons produced by thermal neutron capture gamma rays in several targets placed at the core of the IEA-R1 reactor, in the energy interval from 5.43 MeV to 9.72 MeV. Analysing the photofission and photoneutron data we have observed similarities between the cross sections obtained for U-233 in comparison with other authors. From the photofission cross sections obtained and according to the liquid drop model, the height of the simple fission barrier was determined: $F_b = (5.6 \pm 0.2)$ MeV. The relative fissionability to U-238 was also determined and showed to be energy independent: $F_r = (2.21 \pm 0.25)$. For the competition between the photoneutron and the photofission emission (Γ_n / Γ_f) a constant value was found: (0.54 ± 0.05) in the 6.73 MeV to 9.72 MeV range. By using this result the following nuclear temperatures for U-233 were determined on basis of the FUJIMOTO-YAMAGUCHI model and CONSTANT TEMPERATURE model of level density: $(T = 0.76 \pm 0.07)$ MeV and $(T = 0.60 \pm 0.06)$ MeV respectively.

TARGETS:	ENERGY (MeV)	σ (f) (mb)	σ (n) (mb)	Γ_n / Γ_f
S-32	5.43	(0.69 ± 0.07)	(8.25 ± 4.08)	(-)
Ti-48	6.73	(2.89 ± 0.32)	(13.99 ± 2.05)	(0.87 ± 0.31)
Mn-55	7.23	(1.10 ± 0.13)	(29.79 ± 3.84)	(0.36 ± 0.13)
Pb-207	7.38	(1.49 ± 0.16)	(20.88 ± 2.42)	(0.45 ± 0.11)
Fe-56	7.64	(1.86 ± 0.22)	(21.82 ± 3.20)	(0.46 ± 0.06)
Al-27	7.72	(1.63 ± 0.21)	(26.77 ± 3.73)	(0.64 ± 0.05)
Zn-63	7.88	(1.17 ± 0.13)	(26.14 ± 3.70)	(0.58 ± 0.20)
Cu-64	7.91	(1.89 ± 0.23)	(29.10 ± 4.32)	(0.57 ± 0.03)
Ni-84	9.00	(1.74 ± 0.20)	(72.84 ± 11.57)	(0.32 ± 0.01)
Cr-52	9.72	(0.84 ± 0.11)	(98.48 ± 17.28)	(0.61 ± 0.12)

mean value = (0.54 ± 0.05)

TABLE-I - the targets, their principal line and the fluxes used in this work. The photofission and photoneutron cross sections for U-233 and the competition Γ_n / Γ_f between them are also shown.