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**INTERNATIONAL NUCLEAR DATA COMMITTEE**

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Progress Report on Nuclear Data Activities  
at Pakistan Institute of Nuclear Science & Technology  
in 1982

by

K. Gul

Work performed under IAEA Technical Co-operation Interregional Project  
INT/1/018 on Nuclear Data Techniques and Instrumentation

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without first consulting the appropriate authors.

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Neutron Emission Cross Sections of Fe, Al and Cu

The measurements of neutron emission cross sections of Fe, Al and Cu for 14.7 incident neutrons have been undertaken using the associated particle time of flight technique. The measurements on Fe have been completed which were taken in the energy range 2.5 - 13.5 MeV and laboratory angular range 30°-130°. Monte-Carlo simulation has been used for multiple scattering and flux attenuation corrections. A value of  $538 \pm 39$  mb has been obtained for the neutron emission cross section in the energy range 3.5 - 13.5 MeV. Existence of a level or possibly a doublet at  $10.0 \pm 0.2$  MeV is suggested. The angle integrated energy differential cross sections of neutrons emitted from iron on bombardment with 14.7 neutrons are shown in table I, while the comparisons of the measured integral neutron emission cross sections with previously reported measurements are given in table II.

References:

1. G. Stengl, M. Uhl and H.K. Vonach, Nucl. Phys. A 290 (1977) 109.
2. J.L. Kammerdiener, Report No. UCRL-51232, Lawrence Livermore Laboratory (1972).
3. L.F. Hansen et al, Nucl. Sci. Eng. 61 (1976) 201.
4. D. Hermsdorf et al, Zfk-277 (4), Central Institute for Nuclear Physics Dresden (1972).
5. Glavach et al, Sov. J. Phys. 31 (1980) 205.

Table I

Angle integrated energy differential cross sections of neutrons emitted from iron on bombardment with 14.7 MeV neutrons.

Energy (MeV)	Cross Sections (mb)
3.5 - 4.5	$61 \pm 6$
4.5 - 5.5	$82 \pm 8$
5.5 - 6.5	$86 \pm 4$
6.5 - 7.5	$66 \pm 4$
7.5 - 8.5	$54 \pm 4$
8.5 - 9.5	$43 \pm 3$
9.5 - 10.5	$35 \pm 3$
10.5 - 11.5	$30 \pm 2$
11.5 - 12.5	$23 \pm 4$
12.5 - 13.5	$60 \pm 10$

Table II

Comparison of the measured integral neutron emission cross sections with previously reported measurements. The cross sections are given in millibarn.

Energy range (MeV)	Present (14.7 MeV)	Stengl et al Ref.1 (14.1 MeV)	Kammerdiener Ref.2,3 (14.7 MeV)	Hermesdorf et al Ref.4 (14.6 MeV)	Glavach et al Ref. 5 (14.6 MeV)
3.5 - 13.5	$538 \pm 39$	-	541	$430 \pm 43$	-
3.5 - 8.5	$349 \pm 26$	320	384	$341 \pm 34$	-
8.5 - 13.5	$189 \pm 22$	-	147	$86 \pm 9$	-
6 - 11	$156 \pm 15$	-	182	$132 \pm 13$	-
9 - 13.5	$169 \pm 16$	-	141	$80 \pm 8$	$188 \pm 33$

Studies of n-alpha and n-p reactions on V-51 with 14.7 MeV neutrons

n-alpha and n-p reactions on  $^{51}\text{V}$  with 14.7 MeV neutrons have been studied using CR-39 (Homalite) plastic track detector. The detector was calibrated for protons and alpha-particles for 1-16 MeV energy range. The energy range was subdivided into 7 and 10 convenient intervals for alpha-particles and protons respectively by using aluminium degraders. The detectors were etched in 6 N NaOH kept at 70°. The natural vanadium target obtained through IAEA was exposed to 14.7 MeV neutrons and cross sections for proton and alpha-particle emission were obtained. The present results are shown and compared with previously reported data in Tables I and II.

References:

1. H.K. Vonach et al, Proc. Conf. on Neutron Cross Sections and Technology, Washington D.C. (1968) 886.
2. D. Crumpton, Nucl. Chem. 31 (1969) 3727.
3. Cierjacks, Diplomarbeit, University of Hamburg (1972).
4. E.B. Paul, J. Phys. 31 (1953) 267.
5. D.L. Allan, Nucl. Phys. 24 (1961) 274.
6. C.S. Khurana, Nucl. Phys. 69 (1975) 153.
7. B. Mitra, Nucl. Phys. 83 (1966) 157.
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9. N.I. Molla and S.M. Qaim, Nucl. Phys. A 283 (1977) 269.

Table I

Comparison of the present  $^{51}\text{V}$  (n, ) cross sections with previously reported measurements.

Reference	Cross section (millibarn)
H.K. Vonach et al (1)	$16.3 \pm 0.9$
D. Crumpton (2)	$16.1 \pm 0.9$
Cierjacks (3)	$17.9 \pm 1.0$
Present Work	$20 \pm 1.0$

Table II

Comparison of the present and previously reported measurements of  $^{51}\text{V}$  (n,p) cross sections for 14 MeV neutrons.

Reference	Method	Cross Sections (millibarn)
D. Crumpton (2)	activation	$35 \pm 1.6$
E.B. Paul (4)	activation	$27 \pm 4$
D.A. Allan (5)	activation	$20 \pm 7$
C.S. Khurana (6)	activation	$25 \pm 3$
B. Mitra (7)	activation	$25 \pm 2$
M. Bormann (8)	activation	$36 \pm 3$
N.J. Molla and S.M. Qaim (9)	activation	$33 \pm 3$
Present work	activation	$26 \pm 2$

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