

Status Report of Subgroup 19 to the NEANSC WPEC
April 2001

Activation cross-sections
Coordinator: A.J.M. Plompen, IRMM

Following approval the subgroup started officially 1 January 2001. The report concerns the work that was carried out in the year 2000 prior to the official start and in the first 2 months of 2001.

Progress concerns the following:

ANL(/IRMM)

- A. Fessler has compiled the results from earlier measurement campaigns of the collaboration between ANL/IRMM/FZ-Jülich in EXFOR format and submitted it to NNDC. These files await adoption into the database.
- D.L. Smith and A. Fessler performed a parameter sensitivity study for an evaluation of Cr measurements performed by A. Fessler. A paper has been submitted and preprints are available.
- D.L. Smith has worked 2 months at IRMM to assist with the determination of the occasionally very large summing corrections, the method of correction for low energy neutrons and the finalization of the irradiation and counting campaign for the enriched samples, on loan from JAERI.

IRMM/FZ-Jülich/ANL

- Data analysis and further irradiations and activity determinations were carried out in 2000 and February 2001.
- MCNP calculations were made to determine multiple scattering corrections
- A method was developed that combines time-of-flight spectra and the activation technique to determine the corrections for low-energy neutrons in activation measurements.
- The automated repetitive pneumatic sample transport system was tested and applied to isotopes with half-lives from 1 to 30 s. It will be exploited on several occasions in 2001 and 2002.

NIPNE/IRMM: V. Avrigeanu

- Vanadium reaction cross sections were evaluated taking into account not only the recent measurements of the collaboration but the complete database in the 1-20 MeV region, including the available knowledge on important reaction parameters. A paper is in preparation.
- Modeling of Mo isotopes has commenced with gathering of the primary input information.
- The final model for the level-density and pre-equilibrium contributions is still being explored and needs to be completed before systematic calculations can be performed. Vanadium, Chromium and Molybdenum serve as test cases. The pre-equilibrium calculations use a development of the geometry depend hybrid model.

University of Debrecen/FZ-Julich/IRMM: S. Sudar

- The $^{99}\text{Tc}(n,p)^{99}\text{Mo}$, $^{99}\text{Tc}(n,\alpha)^{96}\text{Nb}$ and $^{99}\text{Tc}(n,n')^{99m}\text{Tc}$ have been studied using the Stapre code with the exciton model for estimates of pre-equilibrium contributions. The treatment of the statistical model level densities is similar to that of Avrigeanu up to the neutron binding energy but differs at higher energies. Sensitivities to model parameters have been determined. They are sizable and lead to uncertainties in predictive calculations for neighboring nuclei of as much as 50% when level density parameters are uncertain to 10%. Similar conclusions are evident from the work by Smith and Fessler, reported above.

Tohoku University: M. Baba

Test experiments of activation by neutron induced reaction have started. Neutrons are produced by the $^7\text{Li}(p,n)$ reaction with a few MeV thick metal target, which is mounted in a vacuum chamber. The beam passes through the target and is dumped in a Faraday cup which is shielded from the neutron beam. Activation samples are placed around a few meter from the target, and analyzed using a high purity Ge gamma-ray detector. Neutron flux is measured by TOF method using NE213. Test irradiations were done for neutrons produced by 30, 50 and 70 MeV protons. Presently, beam currents are not high enough yet, and data analysis is ongoing. We nevertheless obtained appreciable activity and we hope we can obtain cross section results.

JAERI: K. Shibata

Cross sections were calculated for the $\text{Na-23}(n,2n)$ reaction up to 20 MeV using the TNG code. The results are part of JENDL-3.3.