CIELO Pu-239

Date: 27 January 2014

Place: Phone conference

Time: 16:00 (Paris, GMT+1), 8:00 (Los Alamos, GMT-7)

Participants:

CEA: G.Noguère, O.Bouland

LANL: M.Chadwick, T.Kawano, A.Kahler, P.Talou

ORNL: L.Leal

NEA: E.Dupont

The objective of this phone conference is to share progress and plans on the ^{239}Pu evaluation for the CIELO pilot project. A short-term milestone is to have a starter file by May 2014.

M.Chadwick opened the discussion and proposed to build upon the work performed within Subgroup 34 on the evaluation of ^{239}Pu in the resonance region.

Measurements

T.Kawano, M.Chadwick and P.Talou reported on a multi-year experimental programme to study the fission of ^{239}Pu at LANSCE. The capture cross section was measured below 1 keV using DANCE and final results are available (to be published in PRC). The fission cross section will be measured using the new TPC. The emission of prompt fission neutrons and gammas is measured with the Chi-Nu spectrometer. However, these data will not be available in the coming months.

Resolved resonance region

G.Noguère reported on the work performed in the framework of SG34. L.Leal re-analysed all data to create a single consistent set of resonance parameters up to 2.5 keV. These new resonance parameters were included in the JEFF-3.1.1 evaluation for benchmarking against integral parameters from ICSBEP and from experiments in MINERVE (including trends on K1). A specific validation study dedicated to Prompt fission neutron spectra (PFNS) was made by Y.Peneliau (cf. ND2013 draft on the SG34 webpage[1]).

A.Kahler reported on complementary benchmarking work using the new resonance parameters and ENDF/B-VII.1 that he presented during the WONDER 2012 workshop[2]. This work will be described in the SG34 report.

M.Chadwick commented that JEFF-3.1.1 nu-bar at thermal energy is rather low compared to experimental data and to the value used by the standard group. G.Noguère answered that JEFF-3.1.1 (and ENDF/B-VII.1) were only used as bases to validate the new SG34 resonance parameters and that there is probably room for improvement in JEFF-3.1.1 nu-bar (which is briefly described in JEFF Report 21[3]). In particular, it would be interesting to see if the thermal value can be increased when adjusting the nu-bar fluctuations and the PFNS at the same time while keeping good integral performance.

A.Kahler and M.Chadwick proposed to include in the starter file the new SG34 resonance parameters together with JEFF-3.1.1 nu-prompt below 650 eV.

[1] www.oecd-nea.org/science/wpec/sg34
[2] www.oecd-nea.org/science/meetings/wonder2012
[3] www.oecd-nea.org/dbdata/nds_jefreports

Unresolved resonance region

G.Noguère mentioned that the existing averaged resonance parameters evaluated by H.Derrien reproduce nicely the existing data, especially the intermediate structure below 4 keV (which are confirmed by the recent data measured at LANSCE by F.Tovesson). He recommended performing new measurements at high resolution facilities (e.g. RPI, Geel, n_TOF) in order to further improve the description of these fluctuations in the unresolved region.

T.Kawano commented that the use of the LSSF flag still needs to be discussed. He proposed to use LSSF=1, which means that the URR parameters are used only for self-shielding calculations.

Continuum region

T.Kawano reported on modelling activities performed in part within the IAEA group that studies the inelastic scattering and capture cross section data of major actinides in the fast neutron region. There are still large differences in inelastic channels that need to be studied further. He asked whether the JEFF-3.2 test file could be made available to facilitate comparisons. E.Dupont answered that test files are released outside the JEFF project on a case-by-case basis and that he needs to check with the authors[4].

G.Noguère recommended using information from the averaged resonance parameters in the modelling of the continuum. T.Kawano agreed and explained that he plans to keep the existing averaged parameters in MF2 (in order to calculate self-shielding) and to make sure that the MF3 cross sections are consistent with reference data and other experimental data (as well as URR parameters) down to the keV region.

E.Dupont inquired about the time schedule for the new modelling of the continuum and about the availability of model parameters. T.Kawano answered that new results will be presented by the next WPEC meeting in May. On the second question, he commented that (phenomenological) model parameters are not very useful without the associated model/code, but noted that the IAEA started to collect such materials.

Prompt Fission Neutron Spectrum (PFNS)

P.Talou reported on experimental and modelling activities related to PFNS. The last meeting of the IAEA CRP on PFNS took place in October 2013. Contributions to the final report are expected until the end of 2014. He noted that experimental data at low energy are absolutely required to constrain the models, which are not predictive enough. At higher energy, new PFNS evaluations are now available and new Chi-Nu data will be used to improve them.

Starter file – Integral validation

It was agreed to include in the CIELO starter file the new SG34 resonance parameters together with JEFF-3.1.1 nu-prompt below 650 eV, and to use ENDF/B-VII.1 for other data (including PFNS). The file will be updated with new continuum and PFNS data when available and the integral performances will be monitored.

Adjourn

[4] The file is now available at www.oecd-nea.org/science/wpec/sg40-cielo.