CIELO U-238

Date: 21 January 2014

Place: Phone conference

Time: 14:30 (Paris, GMT+1), 22:30 (Tokyo, GMT+9), 6:30 (Los Alamos, GMT-7)

Participants:

CEA: D.Bernard, G.Noguère

JAEA: O.Iwamoto

LANL: M.Chadwick

IRMM: S.Kopecky, A.Plompen

IAEA: R.Capote Noy

NEA: E.Dupont

The objective of this phone conference is to share progress and plans on CIELO evaluations. A short-term milestone is to have starter files by May 2014. It is proposed to have weekly phone conference focused on one specific nuclide each time (^{56}Fe, ^{238}U, ^{239}Pu, ^{235}U, ^{16}O, ^{1}H). Key actors for the nuclide under discussion are invited to join the phone conference.

Measurements

A.Plompen reported on ^{238}U(n,n'g) cross section measurements performed by IPHC (Strasbourg, France) at IRMM. The finalisation of the results is delayed by uncertainties on the degree of oxidation of the target that should be known to correct for parasitic reactions on oxygen. The sample is being analysed at ITU (Karlsruhe, Germany). These results should be available within 3 months, but additional work will be necessary to finalise and publish the cross section data.

R.Capote acknowledged the importance of these data to improve the modelling of inelastic scattering reactions on discrete levels, but was hesitating on the possibility to include directly the measured gamma production cross sections in the evaluation. In addition, the preliminary cross section presented at the NEMEA/CIELO workshop for the scattering on the first level seems questionable. A.Plompen answered that the possibility to measure the conversion electron emitted during the transition from the 1st state to the ground-state is under study, but this will take time.

D.Bernard noted that uncertainties on decay data, especially branching ratio, may account for up to 10% on the reconstructed scattering cross sections. A.Plompen answered that this is being studied including the possibility of branching ratio measurements in the framework of the CHANDA EC project.

Resonance region

S.Kopecky reported on capture measurements at IRMM and n_TOF. A transmission measurement is also foreseen at IRMM, but a new sample is needed. The objective of these new experimental campaigns is to complement the existing data and provide more accurate resonance parameters.

A.Plompen noted that a comprehensive review of the ^{238}U resonance region was done by P.Schillebeeckx et al. It seems that the Derrien et al. evaluation is all right below 150 eV, but some resonances may have to be revisited at higher energy. This report should be released shortly.

R.Capote and E.Dupont reported on ongoing evaluation work performed by I.Sirakov in close collaboration with the IAEA (R.Capote, A.Trkov) and IRMM (P.Schillebeeckx et al.). The latest experimental data will be used to update the resolved resonance parameters. New unresolved resonance parameters will be evaluated up to 150 keV from a selection of reference measurements and coupled-channel OMP results obtained at the IAEA.

G.Noguère recommended to check carefully the average radiation width assumed in the resolved resonance region since this is a very sensitive parameter for reactor applications.

Continuum region

R.Capote reported on the recent IAEA work to develop an improved coupled-channel OMP, which is used to update the ENDF/B-VII.1 evaluation beyond 4 keV. The new data are consistent with the capture and fission reference data although slight deviations may be observed outside the standard energy range. The file is still in a preliminary stage, fine tuning of the nuclear model parameters will be made when the RPI quasi-elastic scattering data and associated modelling information will be released. The initial integral validation is quite satisfactory, but benchmarks are also sensitive to ^{235}U data and it is obviously difficult to identify compensating effects. Of course, further benchmarking is welcome. The file is available on request and a dedicated webpage will be available on the IAEA website shortly.

M.Chadwick inquired about the situation of the (n,2n) cross section and informed us that measurements are planned in the US at TUNL, North Carolina. LANL integral data testing on the (n,2n) tends to support ENDF/B-VII.1 evaluation in its rise from threshold, as shown in the CIELO paper for the ND2013 proceedings. R.Capote answered that the modelling of the (n,2n) and the (n,n') are correlated and that changes in the CC OMP affect both cross sections. The model parameters will be finalised after fine-tuning on RPI experiments. Nevertheless, the calculated cross sections reproduce pretty well the existing differential data, as illustrated below.

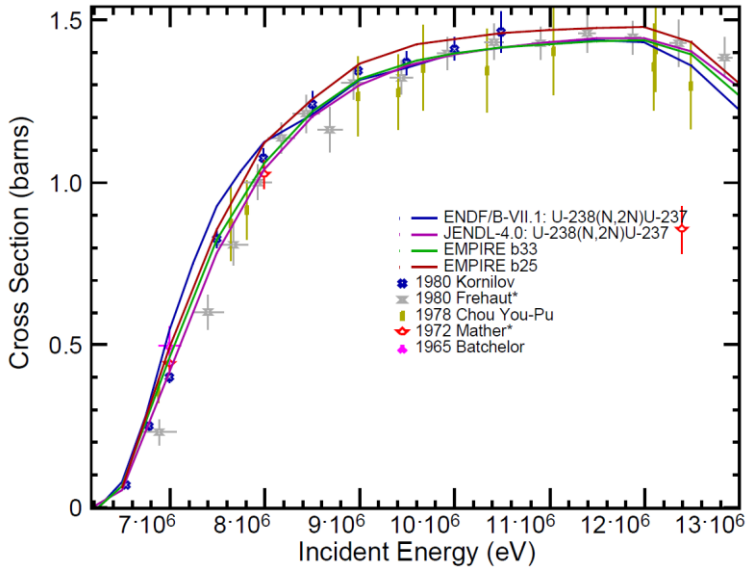

Fig. ^{238}U(n,2n) cross section (*Frehaut data are multiplied by 1.08).

G.Noguère reported on consistent integral trends from experiments in the PROFIL and MINERVE reactors that suggest a slightly higher cross section in the threshold region, e.g. C/E ~ 0.93 (IAEA b33), 0.95 (IAEA b25), 0.96 (JEFF-3.2), 0.97 (ENDF/B-VII.1). It seems that the shape of the ENDF/B-VII.1 cross section (near the threshold) seems to give the best agreement with integral data.

Starter file – Integral validation

It was agreed to use the IAEA evaluation as a starter file and to aim at further improving and validating the file thanks to integral feedback, new resonance parameters, fine tuned CC OMP, etc.

G.Noguère mentioned that CEA can provide integral feedback on (n,g), (n,n') and (n,2n) cross sections but that reliable feedback requires to perform the validation of ^{235}U at the same time.

E.Dupont mentioned that SG39 will also provide feedback on CIELO isotopes if there are consistent trends in existing adjustment/assimilation studies.

Adjourn