ID de Contribution: **18** Type: **Non spécifié**

Measurement of the 35Cl(n,p)35S cross section in the energy range 0.5 −5 MeV

mercredi 17 janvier 2024 15:50 (25 minutes)

Molten salt reactors (MSR) is a GEN-IV technologies using fuel in the form of very hot fluoride or chloride salt. There are many benefits associated to this technology, but a major drawback is the fuel sensitivity to neutron transmutation. In the case of molten chloride reactors, chlorine is the carrier salt with the fuels being, for example, UCl3-NaCl or PuCl3-NaCl. In these cases, neutron sensitivity is linked to the 35Cl(n,p) and 35Cl(n,α) reactions. The other naturally occurring isotope of chlorine, 37Cl, contributes negligibly to the problem having a higher reaction threshold.
Sensitivity studies have shown that in case of fast reactors, the uncertainty of the 35Cl(n,p)35S reaction cross section contributes very significantly to criticality calculations. For this reason, a new measurement of the cross section is currently included in the NEA high priority request list. Accuracy of near 2% in the 35Cl(n,p) cross section is required to achieve the desired neutron multiplication factor keff uncertainty of 300 pcm. An uncertainty of 5-8% is however requested as a minimal requirement.
A collaboration between the University of Granada, the University of Manchester and NPL is carrying out the 35Cl(n,p)35S and 35Cl(n,α)32P cross section measurements at the NPL neutron monoenergetic facility. The measurement is conducted by activation, with 35S and 32P that will be detected by liquid scintillation counting. The neutron energies planned for the measurement are 0.565, 1.2, 2.5, 4, and 5 MeV, which will be generated using 7Li(p,n), 3H(p,n), and 2H(d,n) reactions.
This contribution will present the experimental setup and the preliminary result of the irradiation.

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Classification de Session: Session 1