

Deuteron-induced activation data in EAF for IFMIF calculations (P4-I-104)

Robin Forrest, Ian Cook

EURATOM/UKAEA Fusion Association Culham Science Centre OX143DB Abingdon UK

The main type of activation calculations needed for fusion technology deals with the interaction of neutrons with materials. The roadmap for development of fusion as an electricity producing technology is based on ITER and IFMIF followed by DEMO. IFMIF is a materials testing facility that will enable materials planned to be used in DEMO to be irradiated to very high fluences, so providing the database of material properties required for the licensing of DEMO. IFMIF will use intense beams of high energy deuterons striking a flowing lithium target to produce the neutron field. Although the neutron spectrum is a good match to those produced in a D-T fusion device, there is a significant high energy tail extending up to 55 MeV.

These high energy neutrons were the motivation for increasing the upper energy limit in the neutron-induced part of EAF-2005 so that activation calculations could be made in IFMIF. The deuterons themselves will also make a contribution to activation especially in the target where they strike the lithium but also due to beam losses in the accelerator. It was realised that because of corrosion in the lithium loop there is the potential for a wide range of elements to be present in the target region and it is therefore necessary to have a complete library of deuteron-induced cross section data, just as in the neutron case.

A preliminary library based on model calculations with TALYS using global parameters was used to construct a deuteron-induced library and this was released as part of the maintenance release of EAF-2005.1 at the beginning of this year. This data library has been used with an updated version of the inventory code FISPACT to calculate the activation in the lithium target due to reactions of the deuterons with the corrosion products. These calculations show that deuterons are much more important than neutrons (about a factor of 70) in activating the elements other than lithium. This work shows the importance of the effect and means that the preliminary data library should be improved. This paper will describe the ongoing work to update the library using improved model calculations and available experimental data. This new library will form part of EAF-2007 planned for release next year.