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Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3)
Departament Badań Układów Złożonych (DUZ)
Wtorek: **12.04.2022**
11:30

dr hab. inż. Marcin Szuta, prof. NCBJ

Hypothetical helium migration in uranium dioxide fuel during neutron irradiation in terms of defect trap model

Abstract:

It is known that a large amount of noble gases are retained in the high burn-up fuel. The release of both the helium atoms and the fission gas of xenon atoms behave alike during the annealing process. This lets us infer that migration and release of helium from the fuel under irradiation are also alike the fission gas products – the same mechanisms control these.

Applying the "Ab initio" calculations using the Wien2k program package it is estimated the static energy barrier between interstitial sites in perfect lattice UO_2+He on about 4.15 eV. Given the experimental and calculation data we propose the hypothetical modelling of helium migration and release during irradiation described by the defect trap model of fission gas behaviour published earlier with certain modifications.

A simplified analytical solution of the hypothetical release rate of helium atoms in the function of temperature from the specimen of uranium and americium dioxide mixture is presented which is compared with the experimental ^{88}Kr emission rate from the specimen of single-crystal UO_2 presented in the open literature.

Serdecznie zapraszamy
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