EVALUATED DISPLACEMENT AND GAS PRODUCTION CROSS-SECTIONS FOR MATERIALS IRRADIATED WITH INTERMEDIATE ENERGY NUCLEONS

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The evaluation of atomic displacement and gas production cross-sections for irradiated materials is a challenging task combining the modelling of the various underlying nuclear reaction processes, the simulation of the material behavior, and taking into account, as far as possible, experimental data.

The report describes methods of evaluation and evaluated data recently obtained in KIT for a number of materials.

Atomic displacement cross-sections were obtained for Be, Al, Ti, V, Cr, Fe, Ni, Cu, Zr, and W for nucleon incident energies concerning the irradiation in nuclear- and fusion reactors. The NRT model [1] and an advanced atomistic modelling approach combining the use of binary collision approximation model and results of molecular dynamics simulations [2] were utilized for calculations of the number of stable displacements in materials.

Proton-, deuteron-, triton-, ^{3}He, and α-particle production cross-sections were evaluated for nucleon induced reactions for 278 stable target nuclei from Li to Bi for incident energies up to 1.2 GeV using available experimental data and results of model calculations.

The data obtained were processed into ENDF and ACE formatted data and tested by means of MCNP calculations.

References

[1] M.J. Norgett, M.T. Robinson, I.M. Torrens, A proposed method of calculating displacement dose rates, *Nucl. Eng. Des.* 33 (1975) 50.

[2] A.Yu. Konobeyev, U. Fischer, L. Zanini, Advanced evaluations of displacement and gas production cross sections for chromium, iron, and nickel up to 3 GeV incident particle energy, Tenth International Topical Meeting on Nuclear Applications of Accelerators (AccApp'11), Knoxville, TN April 3-7, 2011.