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Fuel cycle studies of Generation IV fast reactors with the SITON v2.0 code and the FITXS burn-up scheme

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Due to the high computational cost of detailed burn-up calculations, most scenario codes use burn-up tables or parametrized few group cross-sections to calculate fuel depletion in reactors. As a special parametrization approach, a fast and flexible burn-up scheme called FITXS was developed at the BME Institute of Nuclear Techniques, which is based on the fitting of one-group cross-sections as polynomial functions of the detailed fuel composition. The scheme was used to develop burn-up models for the Generation IV Gas-cooled Fast Reactor (GFR), Lead-cooled Fast Reactor (LFR) and Sodium-cooled Fast Reactor (SFR), which are able to calculate spent fuel compositions with high accuracy for a wide range of initial compositions in very short computational time. The models were also integrated into the nuclear fuel cycle simulation code SITON v2.0, developed at the Centre for Energy Research, and several fuel cycle scenarios were investigated and compared with the different fast reactor models concerning the reduction of transuranium inventories and the stabilization of the plutonium inventory.

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