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Actinides in irradiated fuel: A shooting on their capricious redox properties

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Oxide fuels (UO_x, MO_x) are currently used in the nuclear reactors. The study of the actinides atomic environment in homogeneous non-irradiated/irradiated fuel samples was performed employing x-ray fluorescence (XRF) and x-ray absorption fine structure (XAFS) spectroscopy. This investigation is important from a safety view because the actinides can undergo various redox states going from III to VII in the beginning of the family. Chemical bounds, valences and stoichiometries of the actinides (Th, U, Np, Pu, Am, Cm) are determined from the experimental data gained for the irradiated fuel material examined in its center location and peripheral zone of the fuel as well as when possible for the non-irradiated fuel e.g. [1-6]. Their data are compared with those recorded for AnO₂ compounds. The speciation of these actinides in the oxide fuels sample has also been investigated by thermodynamic into account recent chemical data e.g. [7]. The study is completed with recent EELS data e.g. [8,9] offering a zoom in the actinide electronic structures in the dioxide.

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