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Mauricio E. Cazado, Alicia C. Denis

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# MODEL OF NUCLEAR FUEL PELLETS DENSIFICATION UNDER IRRADIATION AND ISOTHERMAL CONDITIONS: APPLICATION TO $UO_2$ FUELS

**Mauricio E. Cazado, Alicia C. Denis**

Sección Códigos y Modelos, Gerencia Ciclo del Combustible Nuclear, CNEA.

Instituto Sabato, UNSAM-CNEA

Avenida General Paz 1499, 1650 San Martín, Buenos Aires, Argentina

cazado@cnea.gov.ar, denis@cnea.gov.ar

**Abstract**

The dimensional changes of a nuclear fuel in operation are strongly determined by two opposite effects. One of them is due to contraction of the as-fabricated pores, giving place to densification which is evident during the first stages of irradiation. This effect is counteracted by the swelling phenomenon provoked by the fission products that progressively accumulate in the fuel material. A model to evaluate the changes in fuel pellets porosity due to radiation and thermal effects taking into account the point defects flow to and from the pores is presented. A simplification of the model to assess the progress of porosity in isothermal re-sintering tests is also given. Simulations are compared with experimental data measured on $UO_2$ fuel pellets with a variety of microstructures at different temperatures and radiation conditions, attaining a good agreement.

Keywords: Nuclear fuel, Densification, Pores distribution, Crystal defects