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Effect of U3O8 Powder Particle Size Distribution on the Microstructure of Dispersion Fuel Plates

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The fuel for pool type research reactors, as the IEA-R1m reactor of IPEN, is fabricated by mechanical assembling of fuel plates which have meats formed by dispersion of U3O8 fuel particles (or other uranium compound) in an aluminum matrix. The method used to fabricate the fuel plates, also called picture-frame technique, involves the rolling of an assembling set composed by two external aluminum cladding plates, one internal aluminum frame plate and one fuel meat fabricated through powder metallurgy techniques, which contains fuel particles dispersed in an aluminum matrix. During the rolling process fragmentation of the brittle U3O8 particles and pore formation are expected. Specifications for the particle size distribution of the raw fuel powder were developed based on theoretical considerations related to ideal dispersions and fuel stability under irradiation. Nevertheless, the particle size distribution of fuel in the rolled fuel meat is the fuel feature that ultimately determines the fuel performance under irradiation. This work presents a correlation between the particle size distributions of the fuel in the raw U3O8 powder and in the fuel meat of the finished fuel plate.