DEVELOPMENT OF A SYSTEM FOR IMMERSION ULTRASONIC ANALYSIS ON UO_2 PELLETS

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ABSTRACT

The characterization of the nuclear fuel porosity is a guarantee of the thermal efficiency and integrity of the fuel and even of the nuclear power plant safety. Currently, the techniques used to measure UO2 pellet porosity involve high costs of equipment, materials and working quarters for radiological protection. Besides, being destructive techniques, they require the use of material samples for porosity measurement. In this scenario, the Ultrasound Laboratory of the Nuclear Engineering Institute (LABUS / IEN) has been developing an ultrasonic technique to measure the porosity of UO_2 pellets. In earlier studies, good results were obtained to measure the porosity of Alumina pellets by analysis of the ultrasonic spectrum, which used the technique of contact among the transducer and the material sample for acquisition of signals. However, as will be here discussed, it was found advantageous to acquire the ultrasonic signals by the immersion technique. In this technique, there is no direct contact among the transducer and the examined object. Both are immersed in water that transmits the signal of the ultrasonic transducer to the material analyzed. Thus, a tank was constructed to accommodate and to handle the UO_2 pellets. This paper show the process of development and testing of the equipment developed for the ultrasonic determination of UO_2 pellet porosity using immersion technique.

Keywords: porosity, ultrasound, frequency spectrum.