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THERMAL POWER CALIBRATION AND NEUTRON FLUX MEASUREMENT OF THE NUCLEAR RESEARCH REACTOR IAN-R1 2015

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ABSTRACT

The IAN-R1 TRIGA (Training Research Isotopes General Atomics) Nuclear Research Reactor is operated by the Colombian Geological Survey (CGS) located in Bogota, this is a pool type reactor and operates at 30 kW. During the year 2012 the reactor underwent a major upgrade on its instrumentation and control systems, task that couldn't have been carried out without the help of the "Instituto Nacional de Investigaciones Nucleares" (ININ) from Mexico.

Following this upgrade a series of flux measurements and power calibration were performed, experiments which will be presented on this paper. Neutron Flux mapping is essential to the Reactor in order to offer accurate irradiation services.

The calorimetric method was used to carry out a Power Calibration with the Reactor operating at 20kW. Five (RTD) thermocouples were positioned axially above the core, and insulation was used to cover the reactor's pool and minimize heat transfer to the surroundings.

The Nuclear Reactor was operated for 4 hours and 45 minutes for the experiment, and temperature data was taken every 15 minutes. A linear dependency of temperature vs time was observed, and the reactor's power was obtained from the slope of the curve.

The reactor's core consists of a square grid in which fuel rods are located. These are low- enriched uranium TRIGA fuel rods (up to 20% U235). Four fuel rods make up a cluster, and each cluster is positioned on a different position on the grid making up the core. Some clusters contain three fuel rods and control rods, or irradiation channels depending on the position in the core.There are three control rods and three pneumatic irradiation channels available within the core.

The Neutron's thermal flux was measured axially with an energized vanadium detector along the positions F1, F2, F3, F4, F5, F6 and at the midpoint on row G between positions 3 and 4. Small gold and aluminum particles (0.1% Au, 99.9% Al) were irradiated and then analyzed by Neutron Activation Analysis.

We can conclude that proper calibration of reactor power and flow measurement of thermal neutrons has been demonstrated in the good performance obtained by the Laboratory of Neutron Activation Analysis (CGS) who radiate samples in this reactor during the first round of proficiency testing Wageningen Evaluating Programs for Analytical Laboratories (WEPAL) received in 2015.

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