

ABSTRACT

A technique for measurement of heavy water concentration in the range of 0 to 100 % by mole using intermediate neutron moderation was experimentally investigated. Fast neutrons, emitted from three 1.11 GBq $^{241}\text{Am}/\text{Be}$ sources, were first slowed down by using polyethylene then the slow neutrons were filtered out using cadmium and boron sheets allowing only intermediate neutrons to reach the sample. In the first set-up, the system was arranged so that the intermediate neutron beam was incident only on one side of the 100 ml sample while a 2.5 cm diameter, 0.3 cm thick NE905 detector was placed on the other side to measure slow neutrons. It was found that the intensity of thermal neutrons decreased with increasing heavy water concentration. In the second set-up, the system was arranged so that the intermediate neutrons were incident to the sample from all directions. A 2.5 cm diameter, 1 cm thick NE905 detector was submerged in a 500 ml heavy water sample. Similar relationship between the thermal neutron intensity and heavy water concentration was obtained with increase in the intensity and the sensitivity. The precision of the measurement was found to be better than $\pm 0.5\%$ (2 σ) by mole of heavy water concentration for 1000s counting time with the accuracy depending upon the calibration procedure.