

Radiation shielding characteristics of concretes incorporates different waste materials

Abstract

Samples of concrete incorporate different waste materials such as iron filings, iron balls of used ball bearings and slags from steel industry were assessed for their anti-radiation attenuation coefficient properties. The attenuation measurements were performed using gamma spectrometer of NaI (TI) detector. The utilized radiation sources comprised Cs¹³⁷ and Co⁶⁰ radioactive elements with photon energies of 0.662 MeV for Cs¹³⁷ and two 1.17 and 1.33 MeV energy levels for the Co⁶⁰. Likewise the mean free paths for the tested samples were obtained. The maximum linear attenuation coefficient values of $0.92 \pm 1.12 \times 10^{-3}$ for CS¹³⁷ and $1.12 \pm 1.57 \times 10^{-3}$ for CO⁶⁰ attained, in this study were for concrete incorporate iron filling wastes of 30 wt. %. The iron balls and the steel slags gave much inferior values. The concrete incorporates iron filings provided the best shielding effect. The microstructure, concrete fillings composite density, the homogeneity and particulate distribution were examined and evaluated using different metallographic, microscopic and measurement facilities.

Keywords; Attenuation Coefficient, Concrete, Iron Ball, NaI (TI), Radioactive, Steel Slag, Wastes Iron Filings