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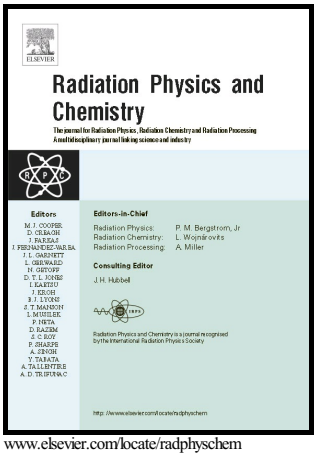

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Studies on mass attenuation coefficients, effective atomic numbers and electron densities for some biomolecules

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Abstract

Mass attenuation coefficients (μ/ρ) for total photon interaction have been determined by using Geant4 package in the energy region 1 keV-1000 MeV for biomolecules such as creatinine hydrochloride, methionine, glycoprotein, glycine, proline and lactose. Such data were then used to calculate the effective atomic numbers (Z_{eff}) and effective electron densities (N_{eff}) for the biomolecules by using the interpolation method. The simulated μ/ρ values were compared with theoretical XCOM results, and good agreement was observed in intermediate and high energy regions while significant discrepancies up to 20% were observed in energy region 10-150 keV. Also, it is noted that the variations occur in Z_{eff} for a given biomolecule depending on photon energy and chemical compositions where the K-absorption edge of medium-Z element may affect sharply the energy dependence of Z_{eff}. The μ/ρ and Z_{eff} values are found to be in good agreement with the available experimental data.

Keywords: photon interaction, mass attenuation coefficient, effective atomic number, Geant4, biomolecule

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