

Water Equivalent from the Point of View of Fast Neutron Removal Cross-Section

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Abstract : Radiological properties of gel dosimeters and phantom materials are often evaluated in terms of effective atomic number, electron density, photon mass attenuation coefficient, photon mass energy absorption coefficient and total stopping power of electrons. To evaluate the water equivalence of such materials for fast neutron attenuation 19 different types of gel dosimeters and phantom materials were considered. Macroscopic removal cross-sections for fast neutrons ($\Sigma R \text{ cm}^{-1}$) have been calculated for a range of ferrous-sulphate and polymeric gel dosimeters using Nxcom Program. The study showed that the value of $\Sigma R/\rho$ ($\text{cm}^2 \cdot \text{g}^{-1}$) for all polymer gels were in close agreement (1.5- 2.8%) with that of water. As such, the slight differences in $\Sigma R/\rho$ between water and gels are small and may be considered negligible. Also, the removal cross-section of the studied phantom materials were very close ($\sim \pm 1.5\%$) to that of water except bone (cortical) which had about 38% variation. Finally, the variation of removal cross-section with hydrogen content was studied.

Keywords : cross-section, neutron, photon, coefficient, mathematics

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