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Study of nanocomposites based P (VDF-TrFE) modified with methacrylic acid in the dispersion of metal attenuators ZrO_2 and Bi_2O_3 for medical shielding materials

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Shields are studied for application on medical radiological procedures for diagnostic imaging of high doses. Synthesis of polymer matrix composites with filling micro and nanoparticles attenuators metal radiation has been investigated. The uniformity of the metal dispersion is important in attenuation efficiency. Nanoparticles of apolar surfaces, thus presenting the hydrophobic and organophilic character, is needed to better reactivity in the polymer composite, and interfere with the dispersion behavior of the organic matrix. Organic acids have been used to improve compatibility of the nanoparticles with the polymeric matrix, such as the methacrylate group, which acts as a surface modifier for nanoparticles making polymerizable radicals present in the synthesis. To this end, this work investigates the composite fluorinated copolymer P (VDF-TrFE) filled with the Bi_2O_3 and the ZrO_2 nanoparticles, modified by methacrylic acid (MAA or MAC), $C_4H_6O_2$. The methodology involves the synthesis of the composites P (VDF-TrFE) / ZrO_2 were obtained by sol-gel process via the hydrolysis and condensation their alkoxides. The MAA serves as an oligomeric species of the metal oxide with methacrylate groups replacing some alkoxylate groups. The decrease in the rate of hydrolysis reactions results in the formation of nanoparticles. Moreover, the synthesis of the composites P (VDF-TrFE) / Bi_2O_3 involve the dispersion of bismuth nanoparticles in the polymer matrix in various concentrations of MAA by casting. The characterization of the composite was made using infrared spectroscopy (FTIR) and ultraviolet (UV-Vis) to observe of the emergence and/or termination of chemical bonds. The irradiation was in X-ray beams to 70kV and equivalent dose of 100 mGy. XQR_2 radiochromic films were placed before and after the surface of the bismuth oxide films, to evaluate the dose attenuation. The composites studied showed a good metal dispersion in the polymer matrix with addition of methacrylic acid and had as good radiation attenuators.

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A theoretical study on testing of nano-scale carbon complicated circuits

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Using carbon as future interconnection and logicmaterial, promises energy and delay efficient systems. In complicated systems containing several chips, testing is very important in terms of energy and test time. In this paper, we calculate the energy and test time of carbon-based complicated systems using an analytical approach. The results are compared to conventional systems to study the advantages of using carbon in terms of testing. For this purpose, four models for resistance and capacitance of interconnections, energy of testing, and test time based on well-known IEEE 1164 are proposed. HSPICE simulation is employed to calculate energy of basic modules like OR gate based on silicon and carbon.

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