Developpement d'un polymère de haute sensibilité intégrable dans un dosimètre gamma sans fil interrogeable à distance

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Abstract
In this research work, we studied the effect of gold nanoparticles on the behavior of polymers under ionizing radiation under an inert atmosphere. The initial aim was to develop highly emissive materials for new miniature, passive, real-time, and long-distance read-out dosimeters by inserting gold nanoparticles (AuNPs) in a polymer matrix. The rational behind was to use either the dose enhancement by secondary electrons emitted from AuNPs or their catalytic properties when appropriate. Beyond the development of a new material, one of the objective of this work was to study the influence of nanoparticles in the solid phase and in the absence of oxygen. Two types of polymers were studied: PMAA and PE. Gold nanoparticles with a diameter of 2 nm were synthesized and incorporated into the polymers. The nanocomposites were irradiated under gamma rays or electron beams and both macromolecular defects and gas emission were analyzed. The results showed that gold nanoparticles have a significant effect on the behavior of polymers under ionizing radiation, depending on the polymer polymer, the nanoparticles concentration, and their distribution in the polymer matrix. In PMAA, gold nanoparticles accelerate chain scission and increase the hydrogen emission radiochemical yield. In PE, beyong a molar percentage of 1%, gold nanoparticles radioprotect the polymer by reducing the formation of macromolecular defects and hydrogen emission.