

Chemical modifications of PET induced by swift heavy ions

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NUCL. INSTRUM. & METHODS IN PHYSICS RESEARCH SECT. B 131 (1997) 159-166

Ion induced chemical modifications of polyethylene terephthalate (PET) were studied by Fourier-transform infrared spectroscopy. The irradiations with Kr (8.6 MeV/u) and with Mo (5.6 MeV/u) ions were performed under vacuum and in oxygen atmosphere, respectively. The overall degradation of the polymer was investigated as a function of the ion fluence in the range from 1×10^{11} to 6×10^{12} ions/cm². A significant loss of crystallinity is related to scission processes of the main chains at the ethylene glycol residue. The benzene ring structures show only small changes under irradiation and do not seem to participate in the degradation process significantly. While various degradation processes known from photochemical degradation take place, the creation of alkynes near the track core is found to be a unique process induced by heavy ions. The presence of oxygen during irradiation enhances the overall degradation of PET and leads to enhanced formation of alkynes and CO₂.