

Pyrolytic effects induced by energetic ions in polymers

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Degradation processes in various polymers (polycarbonate, poly(ethyleneterephthalate), polyimide, and polysulfone) induced by krypton and molybdenum ions of several hundred MeV were studied by infrared and mass spectroscopy. A wide spectrum of degradation products well known from low ionizing radiation were found, which are strongly enhanced if the irradiation takes place in oxygen atmosphere. Most notables are the formation of triple bonded species such as alkynes, cyanates and acetylene. They are created within a radius of about 3-4 nm around the ion trajectory. The complementing observation of degradation products in the bulk polymer and as volatile fragments allows a detailed description of the underlying decomposition mechanisms. The observation of degradation products in close analogy to pyrolysis and the thermal stability of acetylene, strongly suggest that transient temperatures above 1500 K are involved in the track formation process.