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## Aliphatic polymers oxidative ageing under Swift Heavy Ion irradiation: LET, dose and dose rate effects

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Unlike beta- and gamma-rays irradiations that lead to quite homogeneous energy deposition, Swift Heavy Ions (SHI) induce an heterogeneous energy deposition at the nanoscale level. Due to their high LET and because SHI deposit their energy close to the ion path, in a track core of a few nanometers, the local dose nearby these track cores is huge; in between, the dose is very low. A great number of detailed studies were performed under inert environment to assess the influence of the high ionization and excitation densities induced by SHI on polymer ageing. It was shown that, the huge amount of energy deposited locally by SHI induces specific damage processes, which involve complex molecular rearrangements and collective atom motions. Contrary to what has been done under inert environment for assessing the specificity of SHI on polymers, only few detailed studies have been undertaken under oxidative environments. Thus, the aim of the present work is to understand how high ionization/excitation densities induced by SHI impact the mechanisms underlying polymer degradation in presence of oxygen.

Polymers submitted to ionising radiations are modified by the creation of macromolecular defects such as unsaturated bonds, chain scissions and crosslinks, or oxidative defects in presence of oxygen. The counterpart of these macromolecular defects is gas emission. We have examined both processes. In the course of the present work, we have studied the influence of the LET, the dose and the dose rate on different polymers. Additionally, we have considered the influence of the polymer chemical structure on its oxidative ageing, particularly as a function of the LET.

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