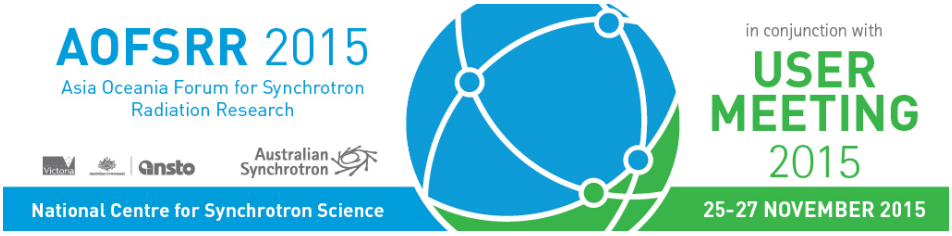

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Structural Changes Induced by Uniaxial Deformation and Photodegradation in Low Density Polyethylene

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In previous work we have used synchrotron based small angle x-ray scattering (SAXS) and a transform of the radially averaged SAXS data, the linear correlation function (LCF)1, to study the structural changes in the semi-crystalline lamellae of low density polyethylene (PE) during photo-oxidative degradation2. Typical SAXS patterns consisted of decay with a superposed broad diffraction feature indicative of the semi-crystalline lamellae. Key parameters extracted from the transformation of data into the LCF were the lamellar spacing, relative volumes of crystalline and amorphous regions in the lamellar region. In this work we use the LCF of data sector averaged in a direction parallel and normal to the direction of tensile deformation to characterise the structural changes in low-density PE during uniaxial tensile deformation from in-situ synchrotron SAXS measurements from both as provided and samples subject to controlled degradation. As provided samples show a region of the tensile curve where the lamellar structure is deformed elastically and a region of plastic deformation where there is considerable deformation of the semi-crystalline lamellar structure. The photo-degraded material shows an elastic deformation of the lamellae before failure.

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Keywords

in situ SAXS, tensile testing, polyethylene

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