IN SITU DIFFRACTION STUDY OF HIGH-PRESSURE TRANSFORMATION OF C_{60} TO DISORDERED sp^2-CARBON

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C_{60}-2DR polymer amorphisation under high pressure has been studied by in situ diffraction techniques employing the Paris-Edinburgh press. The initial interest of this study was to find structural signatures of the so-called magnetic carbon phase, which would be formed by the C_{60}-2DR polymer phase close to the molecular collapse. Evolution of the transformation process was followed by 2D angular-dispersive diffraction. The recorded diffraction patterns show that the C_{60} polymer phase gradually amorphises into a disordered sp^2-carbon phase. Changes in the diffraction pattern of the 2DR C_{60} polymer during the amorphisation transition, which would be indicative of the magnetic phase, were not perceived. This must be confirmed by detailed data analysis, under way.
Samples quenched at different levels of transformation were recovered in order to perform x-ray diffraction and complementary magnetization measurements. Diffraction patterns of the partial amorphised samples show that both the amorphous sp^2 carbon and the 2DR C_{60} polymer are highly oriented. This indicates an orientational relationship between the parent polymeric structure and the amorphous transformed structure: the graphitic planes and C_{60} polymerized planes have a precise orientational relationship typical of martensitic transformations. Therefore C_{60} molecules amorphise in a way that does not involve the complete collapse of the cage structure, in contrast to what one would expect. More experimental data is needed to obtain the full orientational relationship between parent, 2DR C_{60}, and transformed, sp^2 carbon, structures.