ESRF	**Experiment title:** In situ high-pressure high-temperature study of magnetic C_{60} polymer	**Experiment number**: HS 3020
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Report:

The amorphisation of the 2DR C_{60} polymer has been studied using in situ diffraction measurements employing the Paris-Edinburgh press. The main interest of this study was to find structural signatures of the so-called magnetic carbon phase, which would be formed by the 2DR C_{60} polymer close to the molecular collapse. Pressure was first increased to 4GPa-6GPa and then temperature was ramped to 600ºC in order to form the 2DR C_{60} polymer phase. Temperature was again increased but in small steps, in order to amorphise the formed polymer. The high stability of the temperature (and pressure) conditions provided by the Paris-Edinburgh press allowed to control the amorphisation ideally: the transformation was stopped or accelerated at low/high speed, at will. The detailed evolution of the transformation process was followed by 2D angular-dispersive diffraction. The integrated diffraction patterns obtained during the amorphisation process at 5GPa are shown in figure 1. The 2DR C_{60} polymer (pattern at bottom in figure 1) gradually amorphises into sp^2 carbon. 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 presently under way.

Samples quenched at different levels of tranformation 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 defined 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. Detailed data analysis are under way in order to obtain the full orientational relationship between parent and transformed structures.

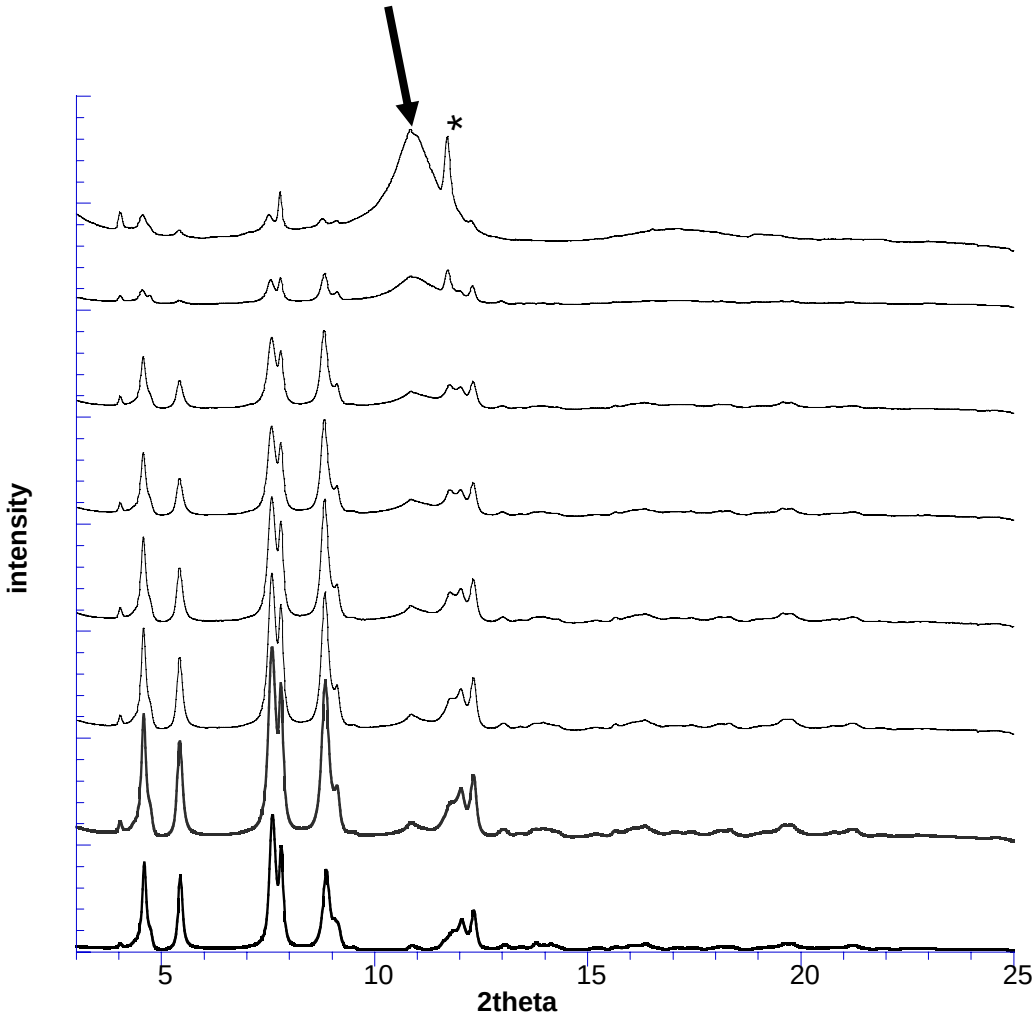

Figure1. in situ diffraction patterns obatined at 5Gpa and increased temperatures corresponding to the 2DR C60 polymer amorphisation process. * indicates a reflection due to the BN container and the arrow indicates the (002) reflection of the amorphous sp^2 carbon.