ESRF	**Experiment title:** *Phase behaviour of isotactic polypropylene under extreme pressures*	**Experiment number**: MA-2976
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Report:

Samples of isotactic polypropylene were crystallized ex-situ in different structures: alpha (monoclinic), beta (trigonal) and gamma (orthorhombic). The three polymorphs have then be submitted to pressure cycling (pressurization-depressurization) at room temperature, using diamond anvil cell operting in the range 0,15-15 GPa.

Examples of X-ray diffraction patterns collected for the three different structure at different pressures are shown in Figure 1. It is possible to note that none of the polymorphs exhibit any phase change in this range of pressures and at room temperature. On the other hand, a meningful amorphization takes place at the higher pressures for all the structure. The drop in the degree of crystallinity is currently under evaluation. The lose of crystallinity is apparently retained upon depressurization, i.e., the system is not able to re-crystallize when the pressure is removed.

It can also be noticed a monotonic shift of the 2theta values of the diffraction peak towards larger values with aplied pressure. This indicates a compression of the unit cell. The d-values for the crystalline peaks of the various polymorphs are reported in Figure 2. For all the different polymorphs a steady decrease of the spacings of the various planes is observed, testyfing the expected shrinkage of the volume of the unit cell. Notably, the mount of compression is not the same for the different planes, suggesting anisotropy in the bulk compression modulus of the various crystalline phases.

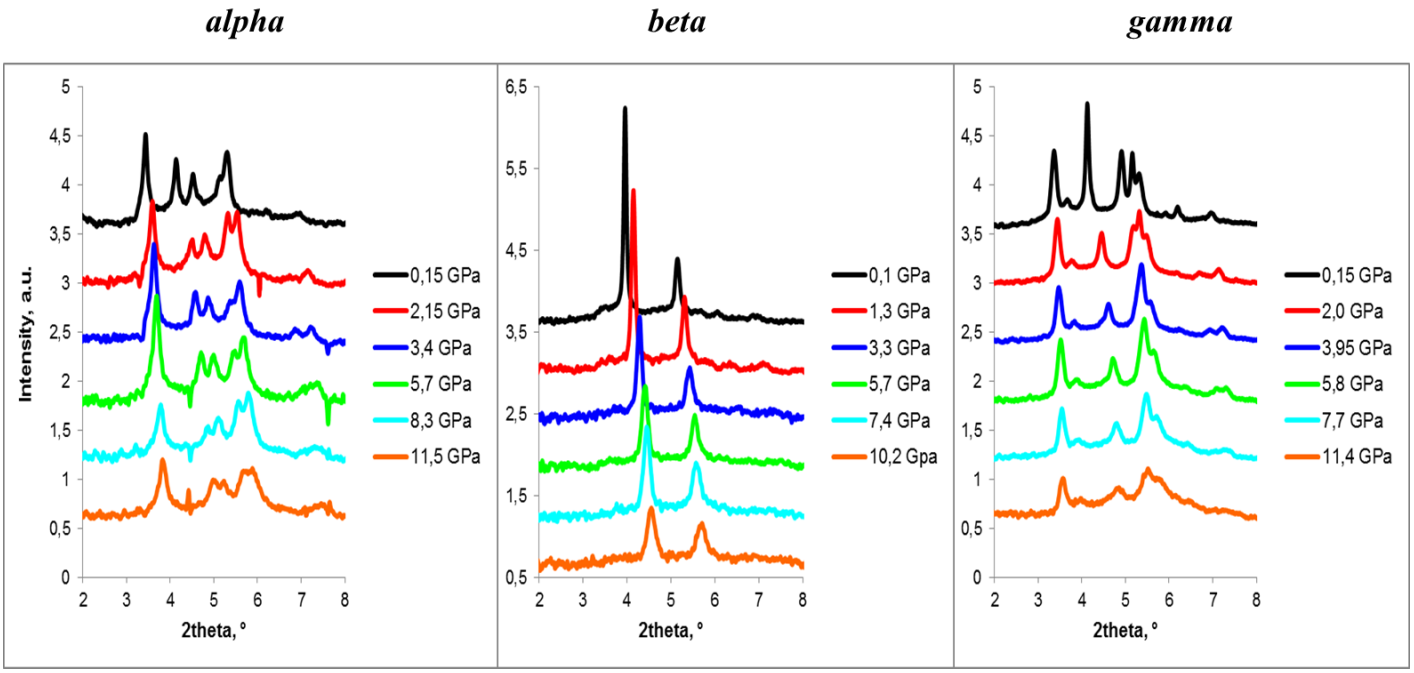

Figure 1: WAXSD patterns of i-PP polymorphs submitted to different pressure levels.

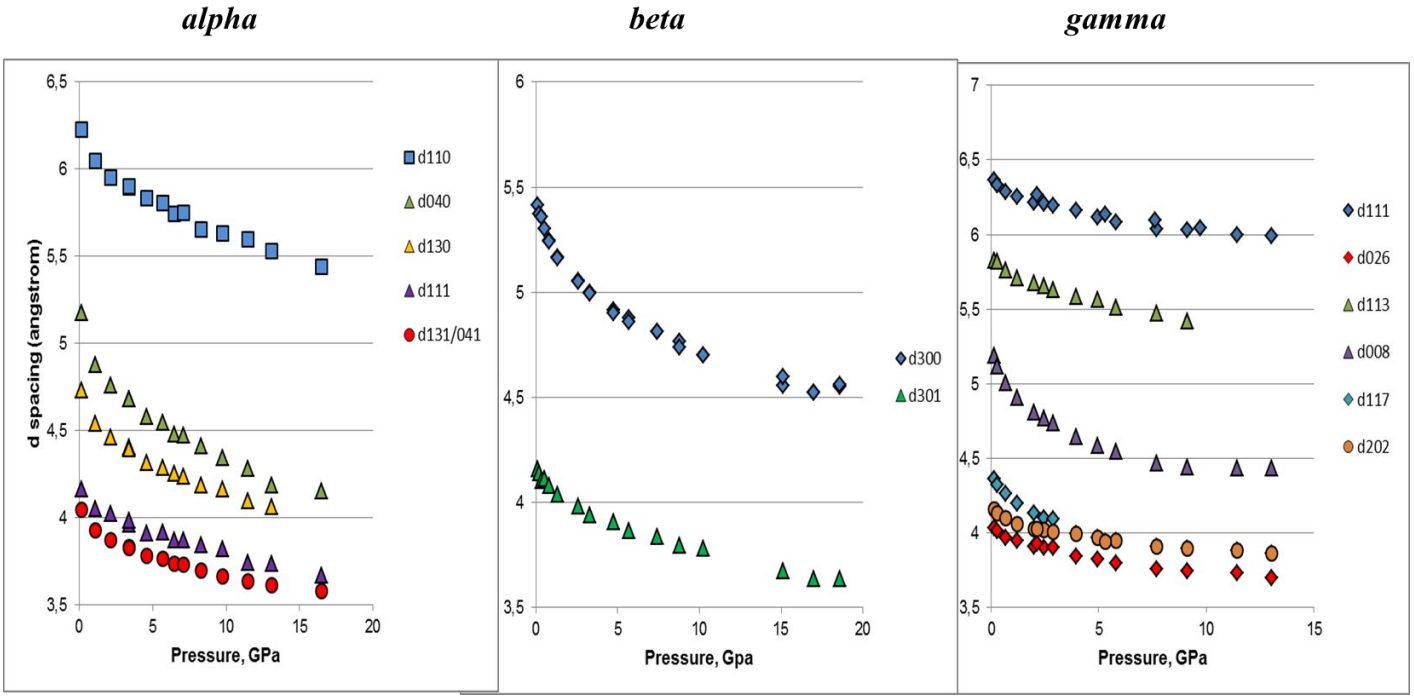

Figure 2: Variation of the spacing of the various crystalline planes families with pressure, for the different investigated polymorphs

Following this first data analysis, we will derive the cell parameters as a function of pressure for the different structures. From the shrinkage of the cell axes we will then calculate the unit cell volume variation with applied pressure, and fit it with an adequate equation of state. From this the response of tghe different i-PP polymorphs to isotehrmal compression wwill be characterized by the value of the bulk modulus. Possible reasons for the difference of compressibility of the various structures will then be discussed in a forthcoming paper.