A tentative scheme for describing recrystallization in cold-crystallized PET

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Based on simultaneous SAXS-WAXS measurements performed at DESY (Hamburg), the re-crystallization process taking place in cold-crystallized poly(ethylene terephthalate) – PET – is modelled using a hybrid approach: a Ginzburg-Landau scheme is adopted to describe the lamellar phase, whereas the confined dynamics characterizing the interlamellar phase is described within the framework of statistical thermodynamics. It is shown that, upon heating a few degrees above the crystallization temperature T_c, the interlamellar amorphous component plays a fundamental role in the stabilization of the lamellar nanostructure. In this case, a spontaneous loss of mobility within the amorphous interlamellar regions is found to be sufficient to preserve the main lamellar nanostructure. However, upon further heating at higher temperatures, a structural reorganization process takes place, involving partial melting and recrystallization. The threshold for structural re-arrangement is found to be of about 20º above T_c for PET.