Abstract Submitted
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Torsional Tapping atomic force microscopy for molecular resolution imaging of semicrystalline polymers[1] JAMIE HOBBS, NIC MULLIN, REBECCA SAVAGE, University of Sheffield — Torsional tapping atomic force microscopy (TTAFM) provides a considerable improvement in signal-to-noise when compared with conventional AFM imaging approaches. This enables the routine use of ultra-sharp whisker tips and leads to true molecular resolution imaging in the crystalline and crystal-amorphous interface zones in semi-crystalline samples. Peak-to-peak resolution below 0.4 nm is obtainable even on topographically rough samples. Here we will present the result of recent studies showing the molecule by molecule chain structure of various polymer samples including polyethylene and polypropylene, showing how chain conformation within the crystal and at the crystal-amorphous and crystal-air interface is influenced by processing conditions. Of particular interest are observations of the roughness of the crystal fold surface at the nanometer level even on samples that have been annealed for long times. It is also clear that the crystal surface that is presented is not always dominated by the chain like nature of the molecules, but in some cases can have a more complex character that might strongly influence how the process of crystallization should be modelled. Data on the chain level internal structure of bulk samples as revealed by cryo-microtoming, will also be discussed.

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