

STRUCTURAL STUDIES OF NAPHTHYL END-CAPPED THIOPHENES IN THIN FILMS

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We review our progress in structural studies of 5,5'-bis(naphth-2-yl)-2,2'-bithiophene (NaT2). We envision NaT2 as a model compound allowing us to understand vacuum-deposited phototransistors. We complement this picture by solution-grown single crystals under compression. High crystallinity allows XRD signal from films down to monomolecular layers and through diamond anvil cells (DACs) with intrinsically high scattering background. Good stability allows long experiments. First, we study NaT2 films on different substrates including Si/SiO₂ with octadecyltrichlorosilane (OTS), graphene, MoS₂ and show how the substrate influences the unit cell, polymorphism, strains, crystal orientation and growth mode. An effect of electrode proximity is also shown. Second, we follow crystal growth during vacuum deposition in situ and the structure in transistors in operando. We monitor film growth layer by layer and probe surface interactions until films manifest bulk characteristics, including a transition from 2D to 3D growth after the formation of wetting layer and other phenomena. Third, we characterize phase behavior in DACs, when increasing pressure up to 10 GPa, identify molecular reorganization and a high pressure phase above 4 GPa, for example.