Patterned Growth of Organic Semiconductor Films by Electron Irradiation Induced F-Centers on Alkali Halide Substrates

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In this study, a new approach is introduced to control structural properties of organic films. Combining AFM, SEM and XRD we demonstrate that electron irradiation induced F-centers (halide vacancies) on KCl(100) surfaces strongly influence the molecular orientation and epitaxial alignment of dinaphtothienothiophene (DNTT) thin films. Due to electrostatic interactions between F-centers and interfacial DNTT molecules, as validated by DFT calculations, DNTT molecules adopt a recumbent molecular orientation and form elongated fibers instead of hexagonally shaped island with upright molecular orientation present on pristine KCl. Interestingly, both morphologies exhibit epitaxial alignments that are understood by higher-order commensurabilities. By inducing F-centers only at defined surface regions, this F-center controlled growth is utilized to achieve laterally patterned DNTT films that are even transferable to other substrates by a wet transfer process [1].

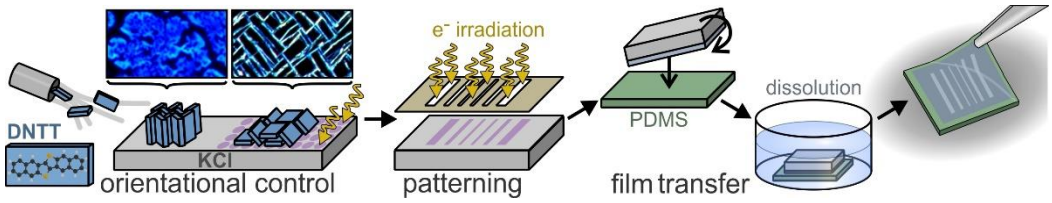

Fig. 1. Scheme of the process chain that allows transfer of patterned organic films to any non-water-soluble substrate.

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