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Study of defects in pentacene single crystals OANA D JURCHESCU, JACOB BAAS, THOMAS T.M. PALSTRA, Solid State Chemistry, Materials Science Centre, University of Groningen, The Netherlands. — Our research focuses on the growth of the pentacene single crystals with a high degree of purity, and the investigation of their morphology and physical properties. We are able to reduce the number of traps by two orders of magnitude compared with conventional methods. This is reflected in the value of hole mobility of 35 cm²/Vs at room temperature increasing to 58 cm²/Vs at 225 K. These high mobilities result from a purification of the material, that consists of removal of 6,13-pentacenequinone, as the major impurity, using vacuum sublimation under a temperature gradient. We further study the influence of air exposure on the electronic properties of pentacene single crystals. Our observations show that gases can diffuse reversibly in/out the crystals, and influence the electronic properties. We discern two competing mechanisms that modulate the electronic transport. On the one hand stands the presence of water from ambient air that intercalates into the crystal lattice and forms trapping sites for injected charges. On the other hand, the presence of oxygen increases the hole conduction. The latter effect is enhanced by the presence of visible light.

Oana D Jurchescu
Solid State Chemistry, Materials Science Centre,
University of Groningen, The Netherlands

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