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Perylenes and phthalocyanines on GaAs(0 0 1) surfaces

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Abstract

The growth of perylenes and phthalocyanines on chalcogen-passivated (0 0 1) surfaces of GaAs has been studied using photoelectron spectroscopy. 3,4,9,10-Perylenetetracarboxylic dianhydride (PTCDA) and copper phthalocyanine (CuPc) form abrupt interfaces without the formation of new covalent/ionic bonds. The substrate core levels are narrowed by PTCDA adsorption and broadened by CuPc adsorption. PTCDA molecules adsorb predominantly at defect sites removing inhomogeneous Fermi level pinning. CuPc adsorption on the S-terminated GaAs(0 0 1) surface generates new states within the GaAs band gap and this causes the substrate Fermi level to shift relative to the band edges. The formation of an interface dipole is inferred for interfaces involving both PTCDA and CuPc. The S-GaAs–PTCDA heterojunction has a straddled energy band profile whereas that of the S-GaAs–CuPc heterojunction is staggered.

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