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Oxygen-related traps in pentacene thin films: Energetic position and implications for transistor performance WOLFGANG KALB, Laboratory for Solid State Physics, ETH Zurich, Switzerland, KURT MATTENBERGER, BERTRAM BATLOGG — We studied the influence of oxygen on the electronic trap states in a pentacene thin film kept under highly controlled conditions. This was done by temperature-dependent gated four-terminal measurements on pentacene thin-film transistors prior to and after controlled oxygen exposure. We developed and used a scheme that allows for the calculation of the essential transport parameters, such as the trap DOS, in an unambiguous way. The results are free from parasitic contact artifacts. Oxidation of pentacene in light leads to a peak of trap states centered at 0.28 eV from the mobility edge, with trap densities of the order of 10^{18} cm^{-3} . The measurements reveal how these traps affect the key device parameters, i.e. subthreshold performance and field-effect mobility. The study supports the assumption of a mobility edge for charge transport, and contributes to a detailed understanding of an important degradation mechanism of organic field-effect transistors.

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