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Copper Phthalocyanine Thin Film Morphology Impact on Impedance Spectrum[1] KYLE ROBINSON, THOMAS GREDIG, California State University - Long Beach — Copper phthlacyanine thin films play an important role as the active layer in gas sensors, organic solar cells, and organic field-effect transistors. The surface morphology of such thin films can be controlled via modification of thermal deposition parameters. Thin films were deposited onto platinum interdigitated electrodes for impedance measurements to study the effect of structure on charge transport. The average grain size increases and changes from α- and β-phase for samples deposited in the temperature range of 295-534 K. AC measurements in the temperature range of 295-385 K reveal relaxation peaks in the impedance spectra. From this spectrum, essential properties are retrieved, such as relaxation times and effective capacities, and correlated with the film morphology. Subject to both photo- and 5-day-dark current trials, photodecay rates are extracted via effective impedance circuit analysis using a phenomenological model that includes contributions from the grain boundary and the bulk part of the grain. Results indicate that the resistance contribution of low frequency relaxation peaks decrease while approaching the phase transition temperature, and vice versa for capacitance. We attribute the low-frequency peaks to grain boundaries, which are reduced in high temperature deposited samples. Hyper β-phase deposition temperatures show a sudden rise in resistance and lower capacitance due to increased roughness of samples.

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