Kelvin Probe Microscopy (KPM) [1] may be used to determine the contact potential difference between different materials using scanning force microscopy. It has been employed previously in the study of organic semiconductor surfaces and interfaces [2]. We are applying KPM to the channel of an organic field effect transistor to determine the density of states [3]. The technique measures changes in the surface potential of the channel in response to changes in the gate potential relative to a grounded source and drain electrode. The measurement setup is shown in Figure 1. In an ordered semiconductor with energy bands and no states in the gap, the surface potential is expected to vary linearly with the gate before being pinned at threshold by the large density of states at the band edge. But in a disordered semiconductor with an energetic dispersion of localized states, the transition at the threshold voltage is expected to be blurred. Figure 2a shows the initial results for the hole transporting organic semiconductor copper phthalocyanine (CuPC). The CuPC is observed to have a broad density of states that stretch well into the gap between its highest occupied molecular orbital (HOMO) and its lowest unoccupied molecular orbital (LUMO). In Figure 2b we plot the density of states as calculated from the relation

\[
DOS = \frac{C_G q^2}{q^2 (dV_{GS}/dU - 1)}
\]

where \(DOS\) is the density of states per unit energy, \(C_G\) is the gate-channel capacitance, \(V_{GS}\) is the gate-source potential, \(U\) is the surface potential and \(q\) is the electronic charge. Because the technique offers previously unattainable resolution, it promises to yield new insights into electronic transport and degradation processes in organic semiconductors.

**REFERENCES**

