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Controlling charge carrier injection in solution processed pentacene transistors by molecular engineering of the electrodes
SANGAMESHWAR RAO SAUDARI, Department of Materials Engineering, University of Pennsylvania, CHERIE KAGAN, Department of Electrical and Systems Engineering, Univeristy of Pennsylvania — We present the device performance of pentacene transistors fabricated from a solution deposited precursor. The bottom-contact pentacene transistors are fabricated by spin-coating N-sulfinylacetamidopentacene precursor followed by thermal conversion of the precursor into pentacene. Hole mobilities >0.1 cm^2/Vs and I_{on}/I_{off} $>10^5$ are repeatedly achieved by this process. The metal-semiconductor interface in organic transistors plays a very important role in charge carrier injection and the overall device performance. Here we have treated the metal surface with self-assembled monolayers having different head and tail chemistries prior to pentacene precursor deposition to tailor the interfacial electronic properties. We correlate monolayer chemistry with device contact resistance and threshold voltage. These studies are used to fabricate devices with high mobility, high I_{on}/I_{off} and low subthreshold swing. Device hysteresis and stability issues will also be presented.

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