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Electrode Optimization in Organic Schottky Diodes

ABSTRACT - Masterthesis

The aim of this thesis is to optimize the electrodes of organic Schottky diodes with different treatment techniques. Different types of surface treatment have a large effect on the charge injection and charge transport properties of the devices. The treatments modify the overall work function of the metal surface.

Schottky barrier diodes based on organic semiconductor were fabricated and characterized with different deposition and surface treatment methods. The current density-voltage (j-V) characteristics of Cu/P3HT/Au and Au/P3HT/Au surface type structure were investigated at room temperature. Device characteristics of both diodes were found to show rectification properties. By using a modified Mott-Gurney model including the charge carrier density dependent mobility model of Vissenberg-Matters, the device parameters mobility prefactor (μ_0), associated Gamma (γ) value and Offset (V) were obtained. By linear fitting for forward bias voltages the Schottky barrier height and very high ideality factor were calculated. The parameter values obtained from different methods were found to be in good agreement. The effect of UV/Ozone treatment at bottom electrode surface was investigated by AFM. Rms roughness for Au surface patterned on PET was investigated. The presence of self assembled monolayer at the metal/organic interface was also investigated by means of contact angle measurement. In addition, the current density-voltage (j-V) characteristics of Au/P3HT/Au surface type structure were investigated in different deposition method of top electrodes.