# Abstract

In the last decade, much progress was made in the research field of organic field-effect transistors (OFET). Thus, organic semiconductors are strongly considered as an alternative concept to silicon technology aiming at 'low cost - low performance' electronics. This dissertation presents the fabrication and characterization of OFETs based on the organic semiconductor material pentacene using different anorganic dielectrics and metallic contacts on heavily doped silicon wafers.

Intensive investigations were made to choose a suitable contact metal as well as a gate dielectric with high electrical stability. Adjusting the process steps to the requirements of OFETs resulted in a high batch reproducibility of the electrical transistor parameters.

A modeling of the output-characteristics revealed large deviations to the shockley-transistor-model due to a large contact resistance leading to a reduced charge carrier field-effect mobility. Introducing an additional pre-factor, the shockley-model could be adapted to the OFETs requirements. Furthermore, the scalability of the electrical parameters in OFETs was proven.

To supply a clean surface for the pentacene evaporation, an oxygen-plasma treatment was applied to the dielectric layer. Consequently, large organic crystallites were obtained enhancing the transistors on-current by a factor of 10.

Degradation experiments revealed a negative effect of oxygen and humidity to the electrical transistor parameters. Each mechanism was separated and quantified. Finally, an encapsulation of the organic layer was carried out using a sputtered teflon layer. A reduced degradation of the device was the result.