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Integration of dispersed SWCNTs in FETs by usage of pyrene functionalized alkanethioates

A. Kossmann[a], T. Blaudeck[b,c], D. Adner[a], S. Hermann[b,c], S. Schulze[d], S.E. Schulz[b,c], C. Tegenkamp[d] and **H. Lang[a]**
[a]Technische Universität Chemnitz, Institute of Chemistry, Germany.
[b]Technische Universität Chemnitz, Center for Microtechnology, Germany.
[c]Fraunhofer Institute for Electronic Nano Systems (ENAS), Germany.
[d]Technische Universität Chemnitz, Institute of Physics, Germany.

Metal nanoparticles attached to carbon-based nanostructured materials enable new nanoelectronic solutions for energy storage (e.g. fuel cells, supercapacitors) [1] as well as in chemical, biochemical [1,2,4] and optical sensors [2,3,4]. A requirement for electronic sensors is the design of a versatile nanoelectronic transducer. In the ideal case, such a component can be functionalized with nanoscopic building blocks in a modular manner that allows selective response and tuning of the sensitivity. Nanoelectronic field-effect transistors (FETs) using individualized single-walled carbon nanotubes (SWCNTs) have been proposed for this case as FET channel material [5,6]. Recently, we presented a scalable on-chip functionalization approach for single-walled carbon nanotubes between palladium electrodes in the geometry of a field-effect transistor with preformed gold nanoparticles [5]. This method is wafer-level compatible and comprises two stages of flow chemistry. In a new chemical approach, we propose the deposition of SWCNTs by inkjet printing, followed by a microfluidic deposition of the nanoparticles. The concept for this type of FET channel is shown in the following schematic representation.

alexander.kossmann@chemie.tu-chemnitz.de