Fabrication of carbon nanostructures on metal deposits prepared by EBID

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Carbon Nanotube (CNT) is the material lying between fullerenes and graphite as a new member of carbon allotropes. Based on their unique properties (high thermal-, electrical conductivity, very high tensile strength and highly flexible) the CNTs can be used in micro- and nano-electronics, catalyst, gas storage. Single-wall or multi-wall carbon nanotubes can be prepared by catalytic chemical vapour deposition (CCVD) [1]. In the present study, metal nanoparticles (e.g. Fe, Co) were employed as catalyst for the growth of the CNTs.

Electron beam induced deposition (EBID) is an excellent method to prepare nanosized metal-containing particles [2]. In our ultra-high vacuum setup we can divide this nano-structuring process in two steps: the first part is the deposition of the non-volatile dissociation products of the precursors by the impact of the electron beam. Here we are able to control the lateral position and to some extend the size of the metal nanostructures. The second part is autocatalytic growth of the metal particles. In this step we are able to control the corresponding enlargement of the patterns and increase the purity of metal particles [3].

By combining a CCVD method for the growth of the CNTs with the EBID process, we envision to fabricate carbon nanotubes at predefined positions with controlled diameter and length. Proof of principle, i.e., the selective growth of carbon nanostructures at the position of the metallic EBID deposits, will be presented and discussed.

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