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# Structure controlled growth of one-dimensional carbon nanomaterials

**Title of the dissertation** Synthesis and application of single walled carbon nanotubes from ethylene as carbon source

**Contents of the dissertation** Carbon nanotubes are one of the allotrope of carbon. Due to their exceptional electronic properties, single walled carbon nanotubes (SWCNTs) have applications in thin film transistor, photovoltaics and energy conversion.

This dissertation reveals the strategies to control the morphology and atomic structure of SWCNTs. For the first time ethylene alone is used as carbon source in floating catalyst CVD (FCCVD). Due to improvements in the morphology of SWCNTs, the FCCVD process produced one of the highest conductivity transparent SWCNT films. To control the structure of SWCNTs, water is used as growth promoter in ethylene based FCCVD. The water assisted process obviously controlled the atomic structure of SWCNTs and produced them in highly uniform structure. This thesis also studies the synthesis of SWCNTs/graphene hybrid and their interaction at the interface.

The high conductivity transparent SWCNT films have application for replacement of industry standard indium tin oxide in flexible electronics.

**Field of the dissertation** Engineering Physics

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Born in Sheikhupura, Pakistan in 1987

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**Place of the defence** Aalto University School of Science, lecture hall T2, Konemiehentie 2, Espoo

**Opponent** Dr. Don N. Futaba, National Institute of Advanced Industrial Science and Technology, Japan

**Custos** Professor Esko Kauppinen, Aalto University School of Science, Department of Applied Physics

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