

Dissertation press release

12.9.2019

Carbon can be colorful

Title of the dissertation Carbon dioxide-assisted synthesis of single-walled carbon nanotubes and their thin film properties

Contents of the dissertation Single-walled carbon nanotubes, as a tubular structure rolled up from an atomic-thick graphene layer, have found many applications in modern technologies, such as transistor, touch screens and new types of solar cells. By nature, carbon nanotubes display grey or black colors.

This dissertation focuses on the atomic structure control of single-walled carbon nanotubes in the fabrication process, when using carbon monoxide as the carbon source and iron nanoparticles as the catalysts. For the first time, the colorful single-walled carbon nanotube thin films were directly synthesized. The secret is to introduce small amount of carbon dioxide during tube growth. Due to the variation of the atomic structure, the single-walled carbon nanotubes can exhibit different colors. In addition to colors, the conductivity of single-walled carbon nanotube thin films is also found to be enhanced by adding carbon dioxide. This thesis also studies the properties of graphene/single-walled carbon nanotube hybrid thin films. By combining the carbon nanotubes (produced by carbon dioxide assistance) with graphene, the hybrid thin film shows remarkably increased conductivity.

The addition of carbon dioxide opens the way towards the structural-controlled synthesis of single-walled carbon nanotubes, readily allowing the applications in electronics fields.

Field of the dissertation Engineering Physics

Doctoral candidate Yongping Liao, M.Sc.
Born in Jiangxi, China in 1989

Time of the defence 27.9.2019 at 12

Place of the defence School of Chemical Engineering building, lecture hall Ke2, Kemistintie 1, Espoo

Opponent Dr. Juan José Vilatela, IMDEA Materials Institute, Spain

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

Doctoral candidate's contact information Yongping Liao
Department of Applied Physics
+358504101280
yongping.liao@aalto.fi