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Chair of Physics

S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 02.02.2026, 11:15 Uhr,

Seminar in person in the seminar room D *or* via Zoom

"Can we use magnetron sputtering to engineer 1D and 0D nanomaterials ?"

Prof. Dr. Stephanos Konstantinidis

Plasma – Surface Interaction Chemistry, University of Mons, Belgium

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Magnetron sputtering (MS) is a well-known technique for producing dense functional thin films. In this presentation, we show that MS processes can be designed to extend this technique beyond the synthesis of conventional 2D thin films.

We first show that sputtering allows fabricating copper nanowires by exploiting geometrical restrictions while depositing atoms onto nanograted substrates. The obtained very long 1D nano-objects can subsequently be transformed into copper oxide nanotubes through a thermally-driven Kirkendall effect [1]. We also show that focused electron beam irradiation enables manipulation of metal nanoparticles embedded inside the oxide nanotubes [2].

Another approach taking advantage of geometrical restriction combines MS with substrate tilting (and rotation) to perform glancing angle deposition (GLAD). In this way, forests of standing nanocolumns are grown on the substrate surface. Substrate tilt angle and rotation speed govern the nano-architecture and give rise to slanted or straight columns, zig-zags, and nanohelices [3-5]. Recently, vanadium dioxide (VO_2) thermochromic slanted nanocolumns and nanohelices have been synthesized. Such materials, whose optical characteristics depend on both the optical line of sight and temperature, enable the fabrication of highly tunable optical platforms [5].

Finally, we demonstrate that MS onto vacuum-proof liquid substrates can produce nanoparticle suspensions without chemical additives [6, 7, 8]. This approach extends further to the synthesis of polymer-nanoparticle composites by carefully selecting the polymerizable host liquid [9].

[1] El Mel *et al*. Small, 2013 [2] El Mel *et al*. ACS Nano, 2014 [3] Dervaux *et al*. Thin Solid Films, 2017 [4] El Mel *et al*. Nanoscale, 2015 [5] Savorianakis *et al*. Surf. Coat. Technol., 2025 [6] Sergievskaya *et al*. Beilstein J. Nanotechnol., 2022 [7] Sergievskaya *et al*. Nanotechnology, 2023 [8] Sergievskaya *et al*. Phys. Chem. Chem. Phys., 2023. [9] Jauquet, Master thesis, University of Mons, 2023.

Zoom – Link:
https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09
Meeting-ID: 963 7593 4537
Kenncode: =r=4YQ