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puh. 050 577 3736 Sirje Liukko

Defence announcement

Public Defence on 19 January 2024

Photoresponsive azobenzene-containing thin films by atomic/molecular layer deposition

Title of the doctoral thesis	Atomic/Molecular Layer Deposition of Photoresponsive Azobenzene-Containing Thin Films
Content of the doctoral thesis	Photoresponsive materials can be prepared by incorporating photochromic molecules in the material structure. Photochromic molecules can undergo configurational or conformational modifications by light absorption, which lead to changes in the molecule's chemical and physical properties. Azobenzene, one of the most employed photochromic molecules, is an aromatic molecule that undergoes efficient and reversible trans–cis photoisomerization. The large change in azobenzene molecular structure and properties enables effective control over the chemical, mechanical, and optical properties of the whole material system into which the chromophore is incorporated. Applications of azobenzene as novel functional materials are highly attractive in diverse fields, such as optical switches, sensors, actuators, optical data storage, nano valves, and local drug dispensers. In this thesis, the emerging atomic/molecular layer deposition (ALD/MLD) thin-film technique was used to fabricate novel photoresponsive inorganic-organic azobenzene-based materials. ALD/MLD processes were developed for three types of photoresponsive materials: zinc-azobenzene containing hybrids, zinc oxide-azobenzene superlattice thin films, and metal-organic frameworks with azobenzene as the linker. The photoresponsive behavior and the effect of structure on the kinetic of photoisomerization were also studied, demonstrating that the azobenzene moieties in the grown films can experience the trans-cis photoisomerization reaction. Furthermore, the reversible absorption/desorption of small molecules (water) for the crystalline films was demonstrated, opening up new horizons for applications such as remote drug delivery and gas storage.
Field of the doctoral thesis	Chemistry
Doctoral candidate and contact information	M.Sc. (Tech.) Aida Khayyami aida.khayyami@aalto.fi
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Remote defence	https://aalto.zoom.us/j/61376620966
Place of public defence	Aalto University School of Chemical Engineering, Circular Raw Materials Hub, lecture hall Platinium, Vuorimiehentie 2, Espoo
Opponent	Professor Catherine Marichy, Universite Claude Bernard Lyon 1, France
Custos	Aalto distinguished Professor Maarit Karppinen, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	atomic/molecular layer deposition, thin film, azobenzene