



Defence announcement

Public Defence on 24 May 2023

Crystalline metal-organic thin films by atomic/molecular layer deposition for future applications in microelectronics

Title of the doctoral thesis	Atomic/molecular layer deposited crystalline metal-organic thin films based on low-valent metals
Content of the doctoral thesis	<p>Crystalline metal-organic materials are an exciting class of materials that have potential applications for instance in gas capture, energy storage, sensing, and electronics. However, high-quality thin films are necessary for the commercial and industrial applications of metal-organic materials. The good news is that atomic/molecular layer deposition (ALD/MLD) is a gas-phase technique that could make thin-film fabrication of metal-organic materials an industrially feasible technique. By using ALD/MLD, entirely new crystalline metal-organic materials can be created, even materials that cannot be produced by traditional wet chemical processes due to interactions with solvent molecules.</p> <p>This research gives insight into the factors that impact whether the thin film material will be crystalline or amorphous. Also, the benefits of crystalline metal-organic thin film materials were explored, such as the benefits from their possibly porous structure, and the role of layered guest-matrix structure for ion and molecule intercalation.</p> <p>The study covers 19 different material combinations of the metal-organic thin-film material family deposited by ALD/MLD. Some of the materials showed promising properties, such as the porosity of copper-benzenedicarboxylate thin films and the electrochemical performance of lithium-based materials. The results indicate that there are still numerous possibilities for the development of new precursor combinations with unrevealed potential for various applications.</p>
Field of the doctoral thesis	Chemistry
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Public defence date and time	24 May 2023 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/64507491749
Place of public defence	Aalto University School of Chemical Engineering, Circular Raw Materials Hub, lecture hall Aluminium, Vuorimiehentie 2, Espoo
Opponent(s)	Professor Jolien Dendooven, Ghent University, Belgium
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, s-block metal, metal-organic framework