

## Defence announcement

**Public Defence on 24 May 2023**

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

<b>Title of the doctoral thesis</b>	Atomic/molecular layer deposited crystalline metal-organic thin films based on low-valent metals
<b>Content of the doctoral thesis</b>	<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>
<b>Field of the doctoral thesis</b>	Chemistry
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<b>Public defence date and time</b>	24 May 2023 at 12 o'clock (in Finnish time)
<b>Remote defence</b>	<a href="https://aalto.zoom.us/j/64507491749">https://aalto.zoom.us/j/64507491749</a>
<b>Place of public defence</b>	Aalto University School of Chemical Engineering, Circular Raw Materials Hub, lecture hall Aluminium, Vuorimiehentie 2, Espoo
<b>Opponent(s)</b>	Professor Jolien Dendooven, Ghent University, Belgium
<b>Custos</b>	Aalto distinguished Professor Maarit Karppinen, Aalto University School of Chemical Engineering
<b>Link to electronic thesis</b>	<a href="https://aaltodoc.aalto.fi/handle/123456789/51">https://aaltodoc.aalto.fi/handle/123456789/51</a>
<b>Keywords</b>	atomic/molecular layer deposition, thin film, s-block metal, metal-organic framework