

#ICMoTalks

**Dr. Sven  
Christian Barth****Goethe University Frankfurt**

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📍 Assembly Hall



## **Nano-Printing using Charged Particle Beams: Precursors, Processing and Hybrid Approaches**

### ■ Abstract

#### **Nano-Printing using Charged Particle Beams: Precursors, Processing and Hybrid Approaches**

Sven Barth

1 Physics Institute, Goethe University Frankfurt, 60438 Frankfurt, Germany.

2 Inorganic Chemistry Institute, Goethe University Frankfurt, 60438 Frankfurt, Germany.

The vast field of additive manufacturing includes true nano-printing techniques based on charged particle beams of ions and electrons. Besides applications such as mask repair in semiconductor industry, further development of precursor chemistry and writing techniques enable fundamental studies of shape-dependent phenomena and the fabrication of functional nanostructures on literally any surface. This talk will introduce focused electron/ion beam deposition (FEBID/FIBID) techniques as a very convenient technique for the spatially controlled formation of pure metals and more complex compositions. The basics of the processes will be outlined [1] and specific examples of FEBID/FIBID-derived material will be presented.[2-5] Moreover, the influence of precursor chemistry, deposition strategy and post-growth processing on the deposit's composition and physical properties will be discussed.[5] Finally, examples of hybrid processes based on the unique combination of FEBID and CVD will be presented enabling a true site-selective nanocoating and cross-sectional control over layer-based materials.[6] In this context, the differences and benefits of FEBID and FIBID will be briefly discussed and changes in physical properties depending on the deposition technique shall be highlighted.

#### References:

[1] *J. Mater. Chem. C* 2020, 8, 15884-15919.[2] *Adv. Funct. Mater.* 2022, 2203889.[3] *Nanomaterials* 2023, 13, 2907.[4] *ACS Appl. Nano Mater.* 2022, 5, 14759.[5] *Nanocale* 2024, DOI:10.1039/D4NR01650E

### ■ Biography

Sven Barth is a group leader and former DFG Heisenberg Fellow at Goethe University Frankfurt, Germany. He has completed his PhD in chemistry at Saarland University in 2008 and his habilitation in 2015 at TU Wien. To date, he has co-authored over 110 articles (H-Index 33) on various topics of materials chemistry. His current research focuses on molecule-based material synthesis by different approaches including CVD, FEBID and FIBID as well as the nanomaterials' structural and physical characterization. The predominant emphasis of his research is the tailoring of the nanomaterial's properties such as electrical transport, optics, sensing capabilities etc. by process control and precursor choice/design. (<https://www.barth-group.com/svenbarth>).