



From Molecule to Nanostructure by Direct-Write Nanofabrication: Fundamental Beam–Material Interactions and Precursor Design

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Focused electron and ion beam induced deposition (FEBID and FIBID) have emerged as versatile, maskless direct-write techniques for fabricating functional three-dimensional nanostructures on both planar and non-planar substrates. Despite the impressive geometric freedom these techniques offer, achieving high chemical purity and reproducibility in the deposited materials remains a central challenge, one that is largely governed by the choice and design of the precursor.

This contribution presents the current state of precursor design for FEBID and FIBID, with particular emphasis on the relationship between molecular structure, decomposition behavior under electron or ion irradiation, and the resulting material composition. Building on our recent reviews,[1,2] key developments in the field are summarized, along with current challenges in the targeted synthesis of new precursors. We further present an overview of our ongoing precursor development work, which aims to translate mechanistic understanding into deliberate molecular design.

The talk is intended for both chemists interested in the synthesis of new metal complexes and practitioners in nanofabrication seeking improved material systems for FEBID/FIBID applications.

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References

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- [2] N. P. Jochmann, A. Salvador-Porroche, and S. Barth; *Adv. Funct. Mater.* **2025**, 35, 49, e07465.

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