4.1.2 SOFT ELECTRON BEAM LITHOGRAPHY (SOFT-EBL) FOR MULTIDIMENSIONAL AND MULTIFUNCTIONAL NANOSTRUCTURE FABRICATION

Z. Pan, S. Donthu, N. Wu, S. Li, V. Dravid, "Directed Fabrication of Radially Stacked Multifunctional Oxide Heterostructures using Soft Electron Beam Lithography (soft-eBL)," *Small*, **2006**, *2*, 274–280.

S. Donthu, Z. Pan, B. Myers, G. Shekhawat, N. Wu, V. Dravid, "Facile Scheme for Fabricating Solid-State Nanostructures using E-beam Lithography and Solution Precursors," *Nano Lett.*, **2005**, *5*, 1710–1715.

The reduced size of materials with controlled orientation leads to novel, unexpected phenomena and a broad spectrum of technologically significant properties in many fields, such as computers, biodiagnostics, and materials. However, approaches to pattern inorganic materials on the nanoscale, especially functional ceramics, is limited owing to the refractory and inert nature of many inorganics. NU-NSEC researchers have recently developed a direct nanopatterning scheme termed soft-electron beam lithography (soft-eBL). This approach synergistically combines the advantages of conventional electron beam lithography and wet chemistry routes for patterning nanostructures of metal oxides and composites. The unique capabilities of soft-eBL include the ability to pattern functional inorganic structures as small as 60 nm and organic structures with dimensions under 150 nm. In addition, soft-eBL is capable of site-specifically patterning multidimensional nanostructures in a facile manner on almost any substrate.