Low energy ELEctron driven chemistry for the advantage of emerging NAno-fabrication methods (ELENA); a Marie Skłodowska-Curie Innovative Training Network

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Synopsis The current contribution relates to a recently endorsed Marie Skłodowska-Curie Innovative Training Network on Low energy ELEctron driven chemistry for the advantage of emerging NAno-fabrication methods; ELENA. Here we discuss the objectives of ELENA relating to the understanding the low energy electron induced processes underpinning two emerging nanotechnology methods; focused electron beam induced deposition (FEBID) and extreme ultra violet lithography (EUVL).

ELENA; Low energy ELEctron driven chemistry for the advantage of emerging NAno-fabrication methods, is a recently endorsed Marie Skłodowska-Curie, Innovative Training Network. The network focuses on the, fundamental, electron driven processes underpinning two emerging nano-fabrication methods; Focused Electron Beam Induced Processing FEBIP [1,2,3] (with an emphasis on deposition FEBID) and Extreme Ultraviolet Lithography (EUVL) [4,5]. Exploitation of these methods has the potential to improve the manufacturing process of existing devices, improve the performance of specific nano-devices through better material control and higher spatial resolution in their fabrication, and enable the fabrication of new devices. Improved EUVL can provide cost efficient high-volume microchip production for the fabrication of more-advanced integrated circuits housing higher component densities than is currently achievable [6]. FEBID on the other hand is ideally suited for direct, one step production of high aspect ratio components and may be integrated in the production of functional devices where the 3D shape of components is critical [1].

For FEBID the objectives of ELENA embrace the development of new precursor molecules for ultimate composition control of the deposits and for the development of in situ purification protocols. Hence, a core objective of ELENA is the design and development of protocols for precursor molecules that lead to purer deposits and higher resolution. With regards to FEBID, ELENA's objective is to achieve the desired control of the deposit composition by understanding the low energy electron induced chemistry involved and to acknowledge this chemistry in the design of new precursor molecules such that pure deposits with well controlled composition may be generated on a routine basis. Similarly for EUV resists the objective is to gain control over the low energy induced chemistry within these resists and to use that chemistry to control adverse and limiting factors such as the mean free path of low energy electrons and acid diffusion within the resist. Hence, to control the low energy electron induced chemistry within the resists to improve the performance of EUVL with regards to resolution, sensitivity and line width roughness (RLS). This is only achievable by understanding the low energy electron induced chemistry involved and to acknowledge this chemistry in the design of new FEBID precursors and EUVL resist material.

In the current contribution we discuss the objectives of ELENA and the means to achieve these.

References

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