Automating Reconstruction of Focused Ion Beam Current Density Distribution

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Spatial distribution of ion current density within Focused Ion Beam (FIB) is influencing all practical applications of FIB instruments, from polishing ultra-thin TEM lamellas to fidelity of nano-patterning and efficiency of gas-assisted processes. While OEMs shroud current density distribution of their instruments in deep confidentiality, extensive effort over recent 5 years was collectively undertaken by community of end users to reconstruct current density distribution of ion beams. Two main approaches have been published so far, one allowing detailed reconstruction of current density profile with extensive analytical work and TEM imaging, and another enabling relatively quick estimations from just one TEM image of single-line etch patterns. Availability of current density distribution information enabled comparative evaluation of FIB instruments for both application-specific industrial uses and for general analytical applications, and facilitated development of efficient gas-assisted processes in semiconductor industry.

Reconstruction procedures published so far reliant on manual data processing and visual comparison. We will present recent efforts of developing image processing algorithms aimed at semi-automation of ion beam current density profile reconstruction for quick comparison of FIB instruments and studying differences of performance in different regimes of ion beam column.