Directed Self Assembly: A practical perspective

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As minimum features in electronic design start to be commensurable to molecular dimensions, the possibility of using self assembling materials at this scale finally becomes tangible. There are still challenges and we can hardly claim that we possess a complete understanding and control of the processes and materials needed to fully realize the potential of molecular self assembling systems.

Yet, under very specific conditions, as it is the case of using grapho-epitaxy for cylinder formation in a PS-PMMA block copolymer system, the industry and academia have enabled sufficient understanding of the mechanisms needed to bring such technology into production.

While there is excellent work exploring other DSA technologies, this work focuses in hole grapho-epitaxy because it may enable two critical manufacturing applications: Contact hole reduction/multiplication, and metal cutting. Traditional approaches require multiple exposures or higher resolution systems like EUV or E-beam. While DSA delivers a higher spatial resolution by careful control of the self assembly process.

Estimates of necessary runtime, accuracy in compact modeling for synthesis and verification of the guiding structures are provided, as well as a description of medium to long-term challenges needed to successfully map other DSA systems to specific electronic manufacturing needs.