Self-assembly of DNA origamis for nanolithographic applications

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In nanotechnology in general and in semiconductor industry in particular, there is an ever-increasing need for smaller and more complex features at an ever-lower cost. Some examples of applications are sub-10 nm features for creation of FinFETs, lateral (horizontal) and vertical gate-all around nanowires, single electron transistors and advanced non-volatile memories (STT-RAM, MRAM, OxRAM, etc.). To address the challenge of patterning at sub-10 nm scale, novel patterning strategies must be envisioned. I will present the method of DNA (desoxyribonucleic acid) origami nanostructures self-assembly as a new approach. DNA origamis are built by programming the assembly of DNA molecules through base pairing. By virtue of its inherent small helix diameter (2 nm), DNA can be programmed to self-organize into various 2D and 3D morphologies at nano-scale resolution \[1, 2\]. Therefore, DNA is a promising mask material for bottom-up lithography techniques.

Although DNA origamis are limited in size (from tenths to a hundred nanometers), micron-scale patterning and high molecular weight objects are obtained through binding of numerous origamis \[3, 4\]. Shape-complementarity is a powerful way of connecting DNA nanostructures, allowing to create reversible binding systems \[5\]. By using this feature, we aim to develop new self-assembly capabilities to transfer desired nanometric patterns with a resolution up to sub-10 nm.