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Patterns with Micrometer Line-width Transferring by DCPIII

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Patterns transferring to a substrate are essential to semi-conductor fabrication. The convention way of transferring a pattern consists of five steps, i.e., 1) spin coating a thin polymer on the substrate; 2) transfers a shadow of the pattern to the spin coated substrate by Lithography; 3) formation of pattern on the spin coated polymer by selective etching; 4) transferring the real pattern to the substrate by non-selective ion implantation; 5) remove of the remaining spin-coated polymer. The repetition of wet etching in lithography may destroy tiny nano-structures and is disadvantage for nano devices fabrication. An alternative is to apply focus ion beam (FIB). Ion beam is generated, focused, and directed in an ion beam column. The ion beam will be deflected and stigmatized by electrostatic or magnetic lens system. A stage system is used to position the fabrication area. The drawback is FIB takes a long time to treat a large area with fine details.

An one step non-contact patterns transferring method was developed by Direct-Current Plasma Immersion Ion Implantation. Complex patterns with micrometer line-width were simultaneously transferred to silicon wafer by Argon ions. The theory and experimental results will be presented and discussed.