Plasmonic Surface Made with Nanoimprint Lithography with Block Copolymer Mold

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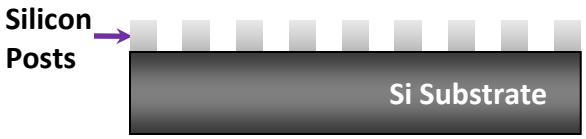
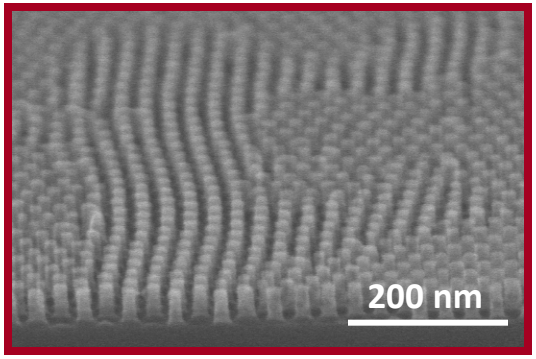
Goals

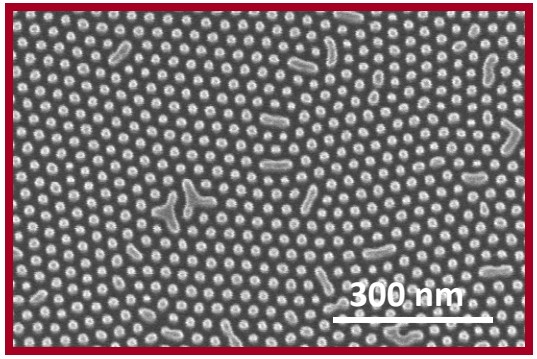
- Use self-assembled block copolymers (BCPs) to create a nanoimprint lithography (NIL) mold. – Completed
- Create plasmonic surface with BCP-patterned NIL mold. – Completed
- Create a NIL mold with long range order of the BCPs via prepatterning of the brush with interference lithography (IL). – Ongoing
- Reproduce features as a demonstration of combined IL/BCP/NIL nanofabrication. – Ongoing

Fabrication of Patterned Nanodots

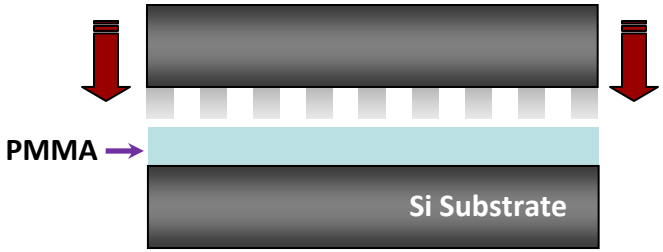
1 *Silicon Posts as Template for NIL*

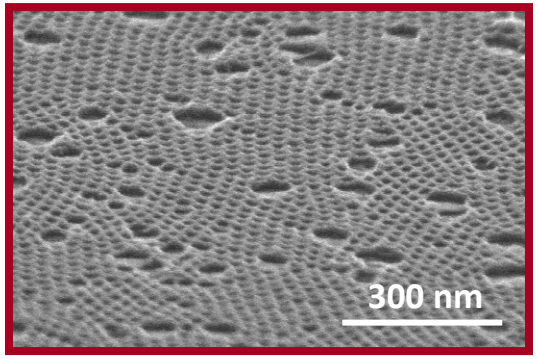




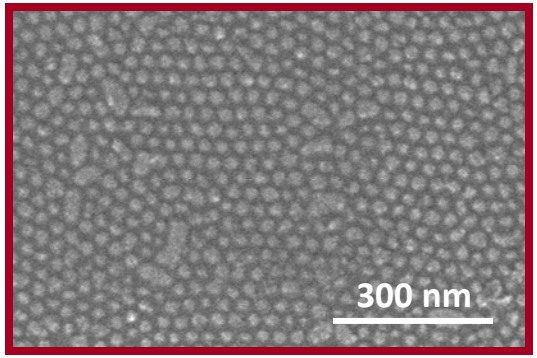


2 *Imprint of Template into PMMA*





3 *Metal Deposition and Liftoff*



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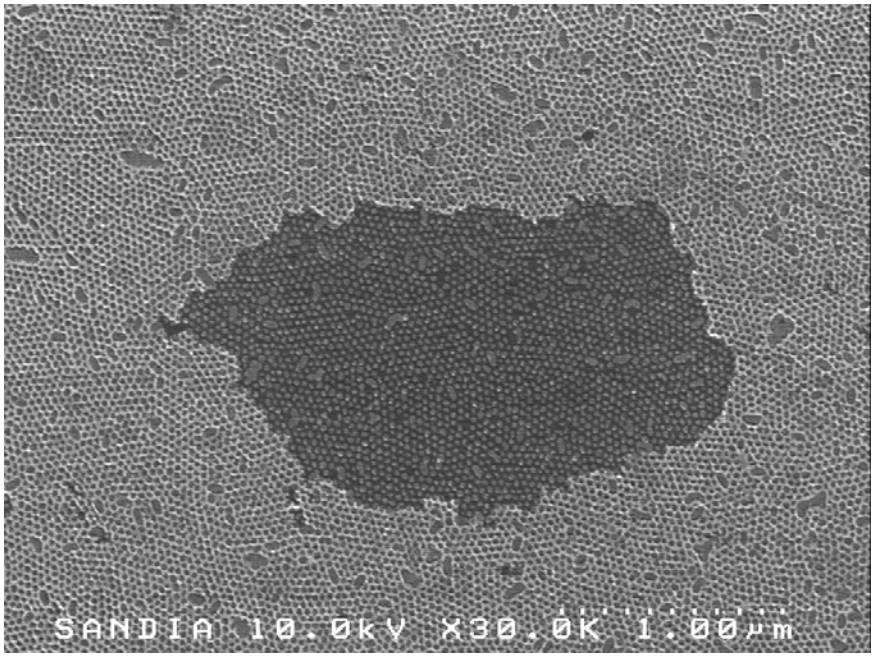
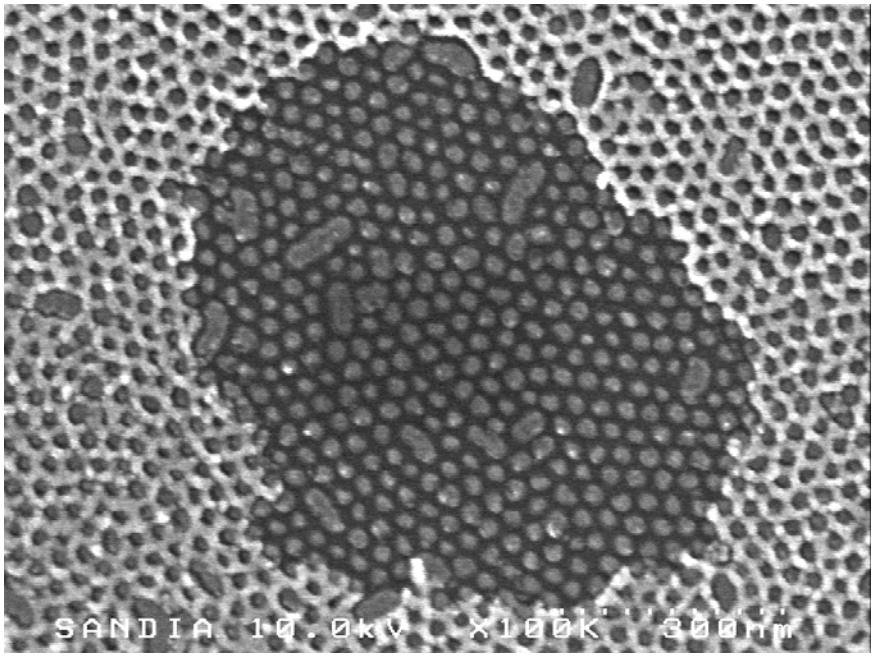
Initial Results – Sparse Area Patterns

- Only small areas successfully lifted off, probably due to metal lock-in

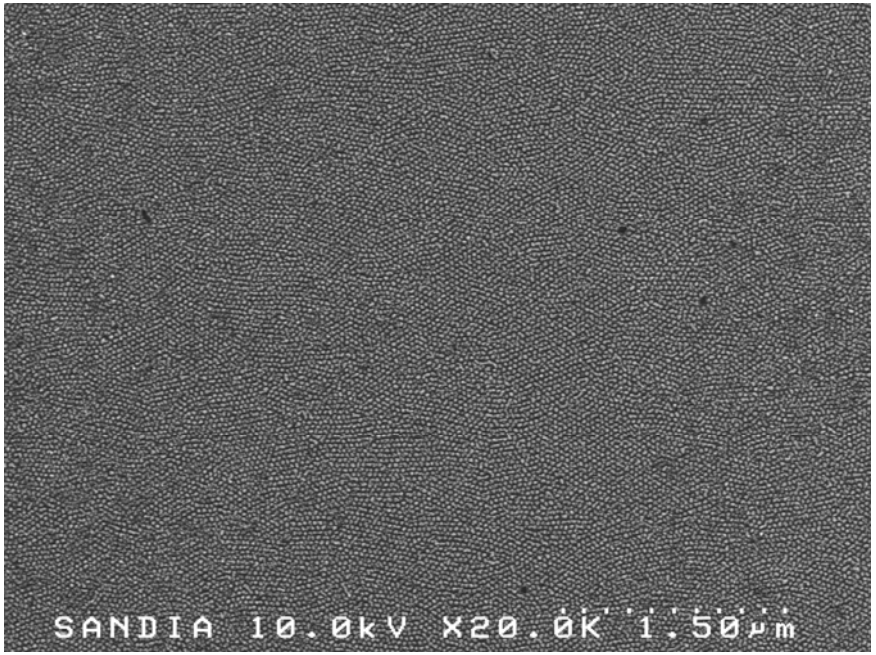


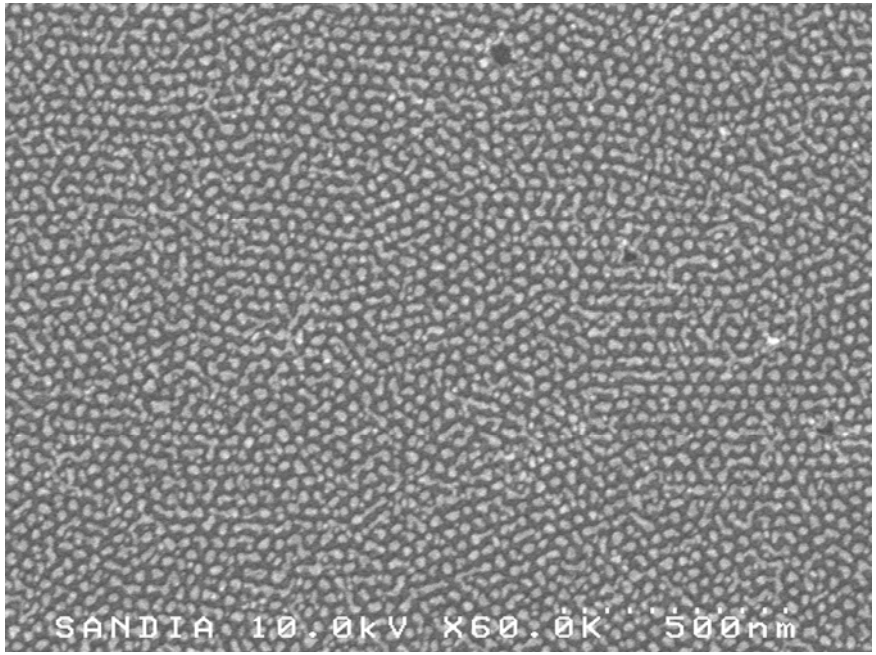


PMMA Thickness Before Etch:	60 nm
PMMA Thickness After Etch:	27 nm
Metal Thickness (Cr/Au):	1.2/5.2 nm = 6.4 nm total

Improved Results – Large Area Patterns

- Etch time increased, metal thickness decreased to yield full-chip pattern transfer





PMMA Thickness Before Etch:	47 nm
PMMA Thickness After Etch:	23 nm
Metal Thickness (Cr/Au):	1.3/3.8 nm = 5.1 nm total

Summary and Conclusion

- Fabrication process improved to yield full-chip pattern transfer
- Abstract accepted to EIPBN 2010

Future Work

- Imprint on oxide substrates for improved SERS performance
- Analysis of plasmonic response using different metals (Au, Ag, Pt) and different metal thicknesses
- Fabrication of integrated device: Coupling of localized surface plasmon and delocalized surface plasmon effects
- Fabrication of template for nanowire growth