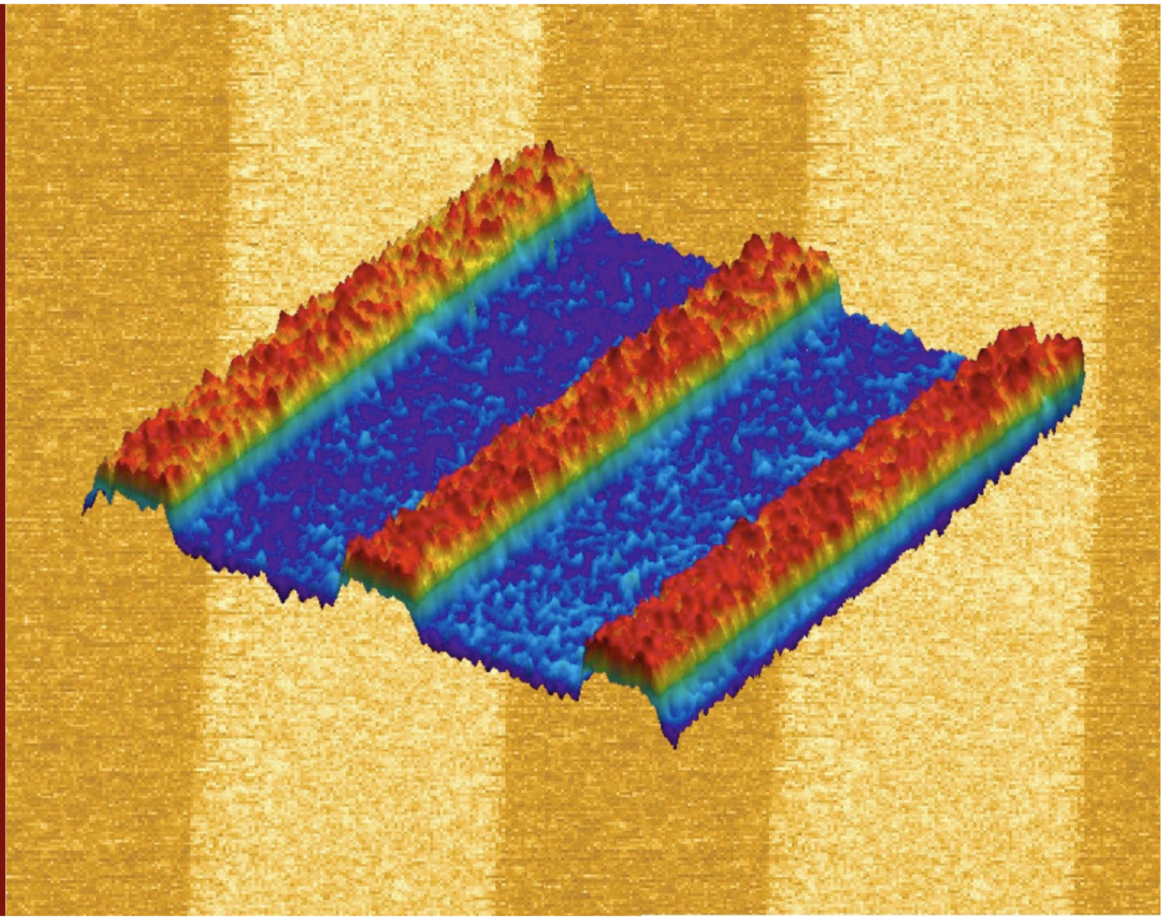
CHEMICAL PATTERNS

Penn State MRSEC



Alternating stripes on this surface are coated with molecular monolayers that terminate in hydrophilic -COOH groups or hydrophobic $-CH_3$ groups, so that a chemically sensitive atomic force microscope can distinguish them. Adv. Mater. **18**, 3258 (2006)

Self-assembly plus nanolithography

not just for semiconductors anymore...

IRG1

A new process for chemical patterning combines molecular self-assembly with traditional lithography to create multifunctional surfaces with precise patterns at the molecular scale. This process enables MRSEC researchers to create surfaces with varied chemical functions, and promises to extend lithography beyond traditional semiconductors to chemical and biochemical applications.

The technique begins with a self-assembled monolayer, a well-ordered chemical film one molecule thick. A photolithographic resist applied on top acts as a selective shield, protecting some regions as others are removed and replaced by new chemical species. This shield prevents the patterns from cross-reacting or intermixing where they touch, so that the process can be repeated to build up complex patterns. If exposed to a unknown mixture of biological chemicals, this "chemically multiplexed" surface could capture the different components in different regions, thereby revealing each for further analysis. Both self-assembly and lithography are highly developed techniques, but in separate domains of science: their marriage here enables the benefits of both to be broad to bear on challenging questions in chemistry and biochemistry.