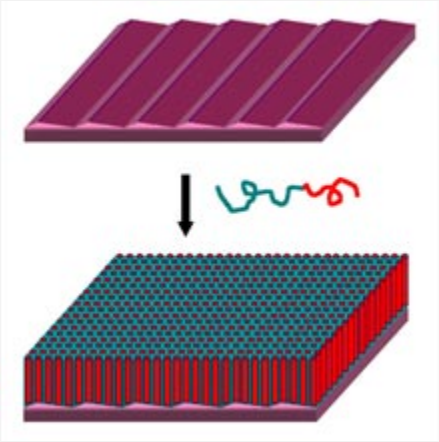
Revolutionary Method Generates New Template for Microelectronics

Researchers at the University of Massachusetts (UMass) Amherst and the University of California, Berkeley, have designed a new method for quickly and efficiently producing super dense, defect-free thin polymer films, and it may dramatically improve the storage capability of microelectronics such as computer memory sticks. The method can generate layered block copolymer, the material used to store computer memory, with more than 10 terabits per square inch, whereas other efforts have achieved at most one terabit per square inch. "We can generate nearly perfect arrays over macroscopic surfaces where the density is over 15 times higher than anything achieved before," said Thomas Russell, director of the UMass Materials Research Science and Engineering Center on Polymers. He co-led the research with Ting Xu, a member of the department of materials science and engineering at Berkeley.

Their approach involved stacking atoms more closely together than previously thought possible to produce the highest density copolymer ever achieved. The team used surface ridges of a base crystal to guide the self-assembly of the block copolymer layer. By varying the annealing temperature, the researchers were able to change the angle and height of the ridges and the depth of the troughs between their peaks. The densely packed troughs that result make more computer memory possible.



Sawtooth ridges on a sapphire crystal guide the self-assembly of nanoscale elements. Credit: Dong Hyun Lee, UMass Amherst

Park, S., D. H. Lee, J. Xu, B. Kim, S. W. Hong, U. Jeong, T. Xu, and T. P. Russell. 2009. Macroscopic 10-Terabit-per-Square-Inch Arrays from Block Copolymers with Lateral Order. *Science* **323** (5917): 1030–1033.

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Patents or other steps toward commercialization:

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