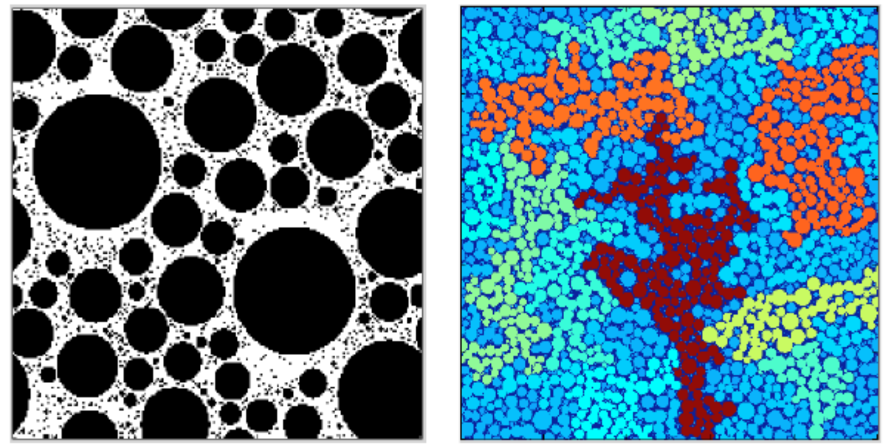
Growth of Ultra-Thin Layered Structure Yields Surprises

Scientific Achievement

Determined how an ultra-thin layer of bismuth ferrite (BFO) "grows" on a surface of strontium titanate (STO)

Significance and Impact

Ultra-thin layered structures are the basis of many new technologies, such as computer memory and data storage; details of the growth process are key to understanding the properties at layer interfaces, where critical behaviors arise



Simulated ICM cluster maps for BFO growth on STO at 50% and 75% coverage. Left: Clusters are still mainly small and isolated. Right: Large irregular connected regions, with a second population of small islands in the spaces between the larger structures.

Research Details

- BFO was grown on a surface of STO via sputter deposition and observed via x-ray diffraction
- X-ray data and atomic force microscopy images show that growth begins with the formation of small clusters, which begin to coalesce into larger ones
- This process was kinetically "frozen" when the clusters reached a critical size, leading to the formation of large interconnected, irregular structures
- Researchers were surprised to discover that growth follows the "interrupted coalescence model" (ICM), which is more commonly used to describe liquid droplet behavior

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