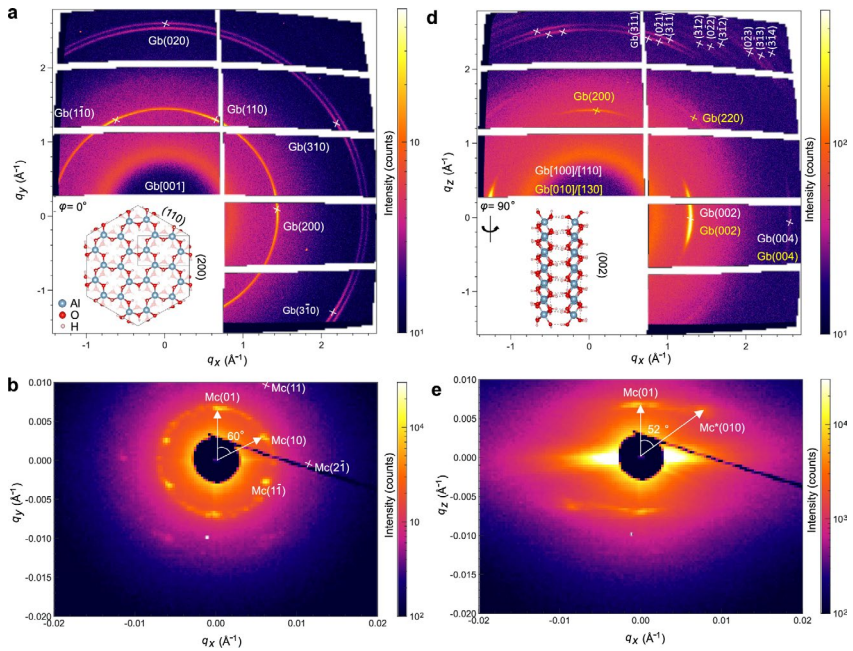
New Insights into Nanoplate Self-Assembly



(a/b) WAXS/SAXS patterns with the mesocrystal placed in the x-y plane and the X-ray beam oriented perpendicular to the gibbsite lattice index plane. (d/e) WAXS/SAXS patterns with the mesocrystal placed in the y–z plane and the X-ray beam parallel to the gibbsite lattice index plane.

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Work was performed in part at NSLS-II

Scientific Achievement

Researchers demonstrate how gibbsite nanoplates self-assemble into larger, ordered “mesocrystals” by sliding into a stable, staggered arrangement rather than perfectly aligning.

Significance and Impact

These findings reveal how atomic-scale forces influence macroscopic mesocrystal structure, which could help design better materials made by particle attachment.

Research Details

- Thin layers of water between plates, along with electrical charges at the edges, help guide how the plates move into an offset position.
- Computer simulations revealed that this staggered arrangement is actually more stable and energy efficient than perfect alignment.
- Single crystal X-ray scattering experiments were performed at the Complex Materials Scattering beamline at NSLS-II to resolve the long-range order and its link to plate orientation.