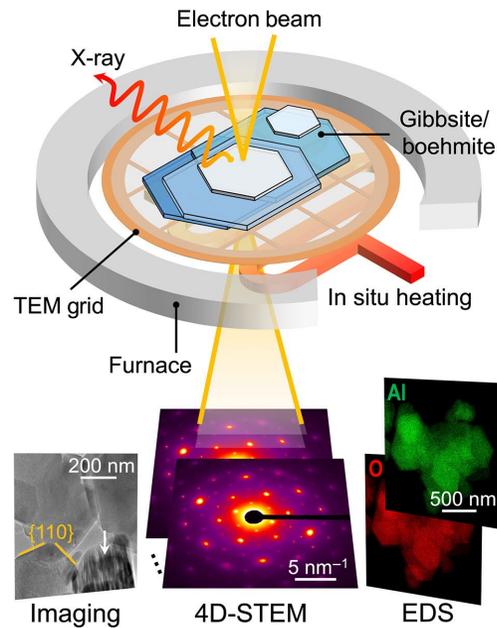


Previously Unknown Strain-Relief Mechanism Revealed



X-ray diffraction was used to resolve the gibbsite/boehmite crystal structure, while low-dose transmission electron microscopy imaging captures morphologies. In addition, 4D scanning transmission electron microscopy combined with energy-dispersive spectroscopy mapping reveals nanoscale local heterogeneities in both strain distribution and chemical composition.

Q. Zheng, B. Li, S. Liu, C. Cao, J.M. Rimsza, Q. Zhang, J. Bai, C. Chang, J. Wang, C. Liang, H. Mao, M. R. Carbone, D. Lu, T. Pyatina, and H. Zheng, Strain release through hydrogen bond-mediated layer twisting. *Sci. Adv.* **11**, eady6869 (2025).

Scientific Achievement

Scientists have discovered a previously unseen nanoscale strain-relief mechanism in boehmite crystals, where hydrogen bonding drives the twisting of atomic layers.

Significance and Impact

New insights into strain-driven transformation could help scientists tune the properties of materials used for flexible electronics, semiconductors, catalysts, and more.

Research Details

- Moiré pattern evolutions revealed distinct strain release mechanisms.
- Simulations using theory and computational resources at CFN show that when the layers are slightly twisted, the energy changes are mainly caused by the interaction of hydrogen bonds between boehmite layers.
- Multimodal X-ray experiments at three beamlines at NSLS-II (QAS, XPD, and PDF) helped to characterize the crystal structure.

Work was performed in part at NSLS-II

