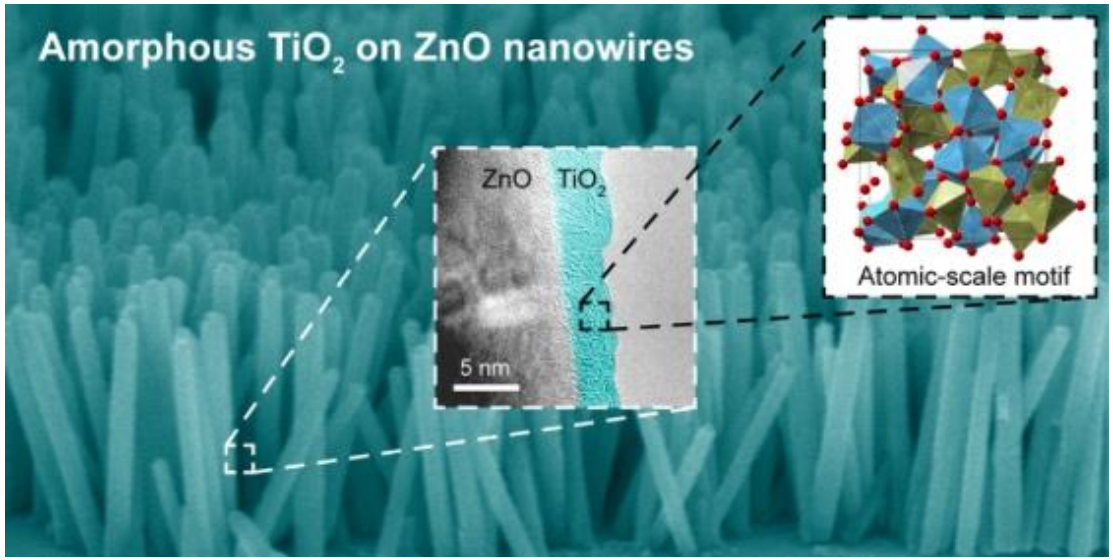
Optimizing the Growth of Coatings on Nanowire Catalysts

Scientific Achievement

Scientists demonstrated a new optimal path to grow titania layers on zinc oxide (ZnO) nanowires.

Significance and Impact

These results have the potential to improve solar cell efficiency and could be transferred to other applications in energy storage.



Work was partly performed at Brookhaven National Laboratory

Research Details

- The study showed that a low-pressure O_2 plasma treatment at the CFN is the best approach for a uniform coating.
- X-ray characterization at NSLS-II's ISS and IOS beamlines revealed highly amorphous titania layers different from bulk.
- First principle calculations at CSI and NERSC suggest titania shell contains a large fraction of under-coordinated Ti^{4+} ions.
- These calculation matched the experimental results.

The background shows a scanning electron microscope image of the titania-coated nanowires, while the foreground shows a high-resolution transmission electron microscope image that distinguishes between the ZnO core and titania shell and the atomic-scale motif of the shell.

D. Yan, M. Topsakal, S. Selcuk, J. L. Lyons, W. Zhang, Q. Wu, I. Waluyo, E. Stavitski, K. Attenkofer, S. Yoo, M. S. Hybertsen, D. Lu, D. J. Stacchiola, M. Liu, *Nano Lett.* **19:6**, 3457-3463 (2019).