Influence of Structural Defects on Biomineralized ZnS Nanoparticle Dissolution: An In Situ Electron Microscopy Study

Challenge

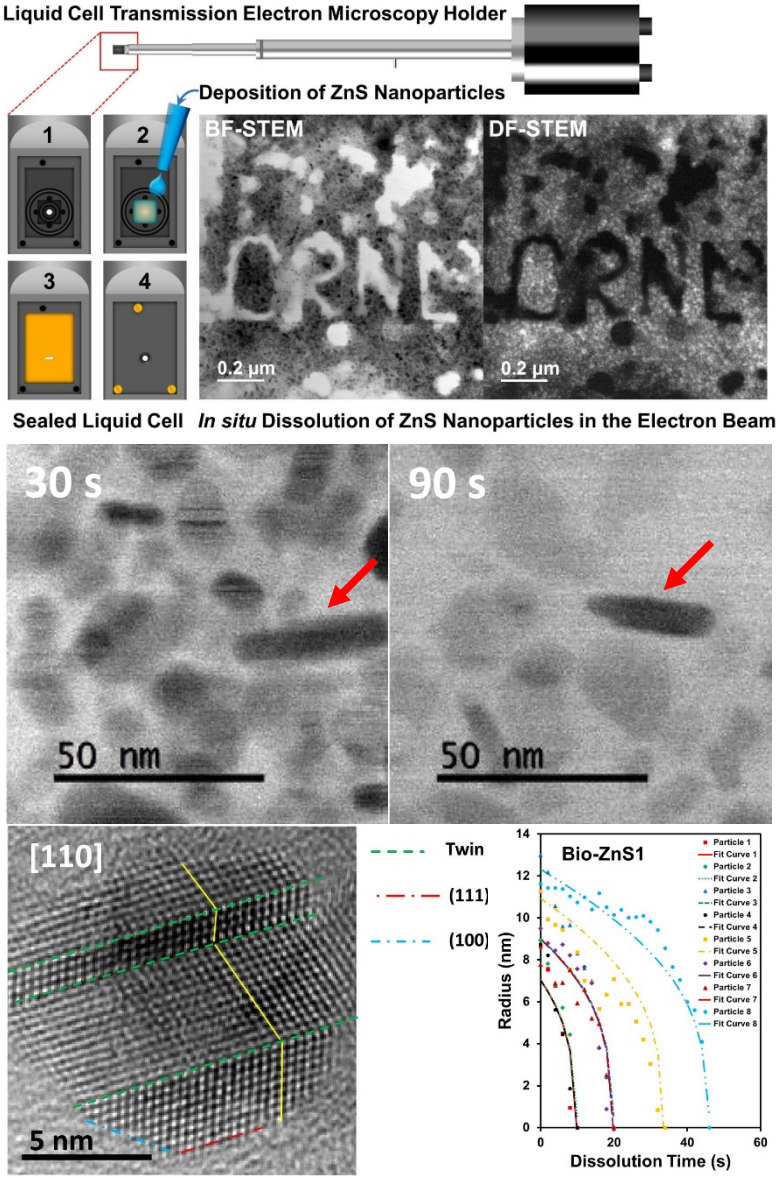
- Elucidate how crystal defects in metal sulfide nanoparticles impact their overall surface energies and potential bioavailability

Approach and Results

- Liquid cell scanning transmission electron microscopy (LCTEM) is a viable technique for evaluating the dynamics of ZnS nanoparticle dissolution.
- Biogenic ZnS nanoparticles with defects are more reactive than abiotic defect-free nanoparticles (higher surface energy).
- Trace elements and organic molecules have a significant impact on the promotion or inhibition of crystal defect formation.

Significance and Impact

- The formation-to-dissolution pathway observed has broad implications for predicting the bioavailability and fate of Zn and other trace metals in water-sediment systems at transition zones or interfaces with sharp environmental changes.



Reference: Eskelsen, J. R., J. Xu, M. Chiu, J.-W. Moon, B. Wilkins, D. E. Graham, B. Gu, and E. M. Pierce. **Influence of structural defects on biomineralized ZnS nanoparticle dissolution: An in-situ electron microscopy study**, *Environmental Science & Technology*, **2017**, 52, 1139-1149. **DOI:10.1021/acs.est.7b04343**