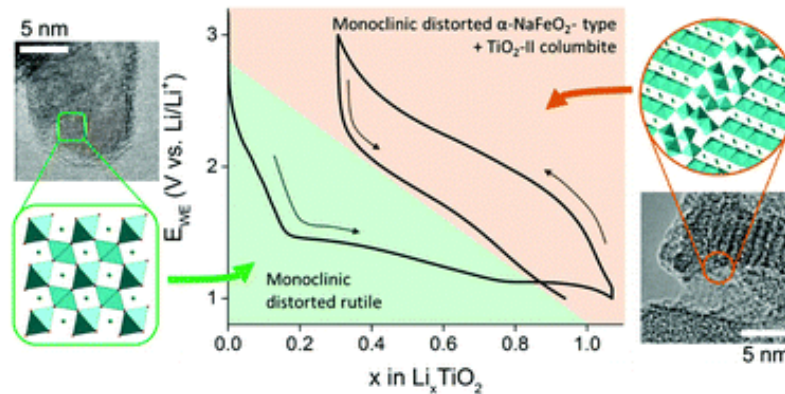
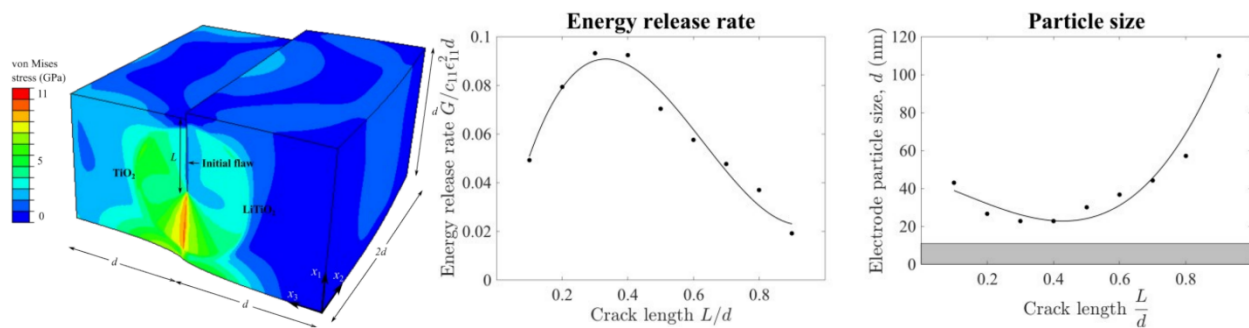


Rutile nano-electrodes undergo structural changes during repeated battery operation



Using a combination of total scattering analysis and transmission electron microscopy, Christensen et al. investigate the atomic-scale structure of the rutile (TiO_2) electrode during charge-discharge process. They demonstrated the phase-change behavior of rutile as it transformed from an ordered to a disordered state with repeated cycling.

Why do these nano-electrodes amorphize and not fracture?



On the theory front, we reasoned as to why the rutile nano-particles amorphized (phase-change behavior) instead of dissipating their stored elastic energy by electrode fracture. Our fracture analysis calculations estimated the critical size of rutile nano-particles below which fracture is suppressed to be ~ 20 nm. The nano-particle sizes used in this experiment were about ~ 11 nm.

Reference

- Christensen, C. K., Mamakhel, A., Balakrishna, A. R., Iversen, B. B., Chiang, Y. M., & Ravnsbæk, D. (2019). Order-disorder transition in

nano-rutile TiO₂ anodes: a high capacity low-volume change Li-ion battery material. Nanoscale, 11, 12347.