Quantitative electron microscopy of 2D materials

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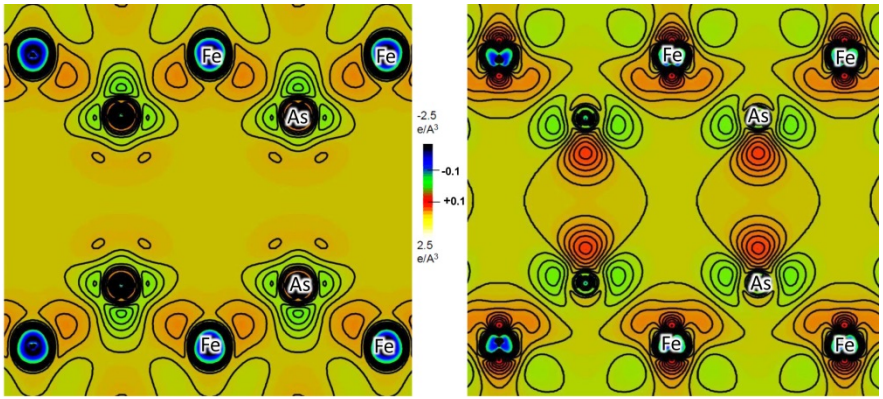

Experimental valence electron density map of $Ba(Fe_{1-x}Co_x)_2As_2$ superconductor for (left) x=0, Tc=0, and (b) x=0.1 Tc=22.5K (optimally doped) in the (100) plane using quantitative electron diffraction. The color legend indicates the magnitude of the charge density and the contour plot has an interval of 0.05 e/Å^3.
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Keys features

- Aberration corrected electron microscopes (sub-angstrom spatial resolution, 0.3eV energy resolution)
- Ultrafast electron diffraction instrument (2.8MeV, 120fs temporal resolution)
- in-situ capabilities, electromagnetic biasing at 6K, magnetic imaging, potential mapping, etc.

Scope of effort

- Quantitative structural analysis with various electron probes
- Compare experiment with calculations

Challenges to address

- understand the charge, orbital, spin and lattice correlation
- the role of interface and defects in 2D materials

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