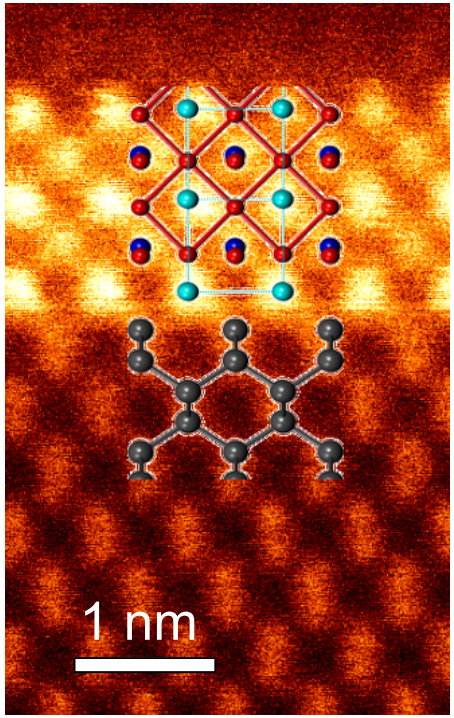
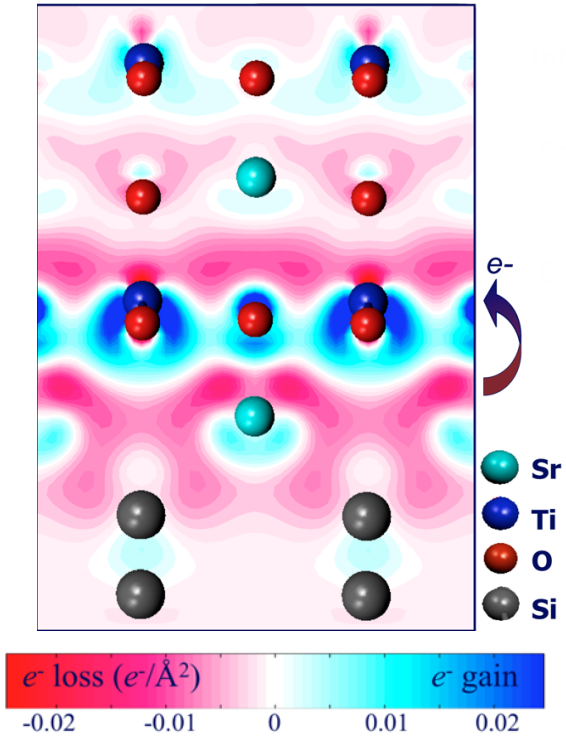
# Impact of interfacial bonding on oxide functionality

Transition metal oxides exhibit many properties that can be harnessed in novel devices. For example, an epitaxial ferroelectric on silicon enables a nonvolatile transistor that remembers its state without continuous power consumption. A critical question is how the oxide/silicon interface affects the oxide functionality.

TEM image of the epitaxial $SrTiO_3$/Si interface.

Superimposed is the predicted structure from first principles theory, showing excellent agreement.




Theory shows that the interfacial bonding is ionic: electrons transfer from the silicon to the oxide.

The positive Si layer then pushes the Ti cations away and pins the oxide polarization.

*A.M. Kolpak, J.W. Reiner, M. Sawicki, C. Broadbridge, D. Su, Y. Zhu, C.H. Ahn, F.J. Walker, and S. Ismail-Beigi*

**CRISP** *Center for Research on Interface Structures and Phenomena*
Yale University | Southern CT State University | Brookhaven Natl Lab
NSF-MRSEC DMR-0520495