Scientific Achievement

We showed diffusion coefficients in fcc Co follow a parabolic trend for solutes across the transition metal series. Here the change in the diffusion coefficient correlates with d-band filling, peaking near half d-filling, and then finally decreasing back down as the d-shell completely fills. We find that large solutes diffuse much faster than small ones due to what we named the **strain-mediated mechanism**. We found for the extremely large solutes (group III), the monovacancy mediated mechanism of diffusion is not valid.
**Significance**
Beside the scientific understating of diffusion in fcc metals, this research provides valuable information for larger-scale ICME tools: 1) developing CALPHAD type diffusion mobility databases, similar to the ones that exist for Mg alloys and Ni-based superalloys, and 2) constructing predictive, quantitative phase-field models of microstructural evolution.

**Citation**