

“Using RIXS to probe effects of disorder and quasiparticle lifetime broadening”

We present measurements and calculations of x-ray absorption (XAS) and resonant inelastic x-ray scattering (RIXS) at the nitrogen K edge of ammonium nitrate. The spectra highlight shortcomings of traditional assumptions used in x-ray spectroscopy calculations. We see unexpectedly large, peak-dependent effects from both vibrational disorder and quasi-particle lifetimes. Notably, the emission from the NO sigma bonds is extremely broad despite almost no dispersion in the band structure. *GW* calculations reveal that this is a characteristic of the quasi-particle state whereby a hole in the sigma bond has a characteristic lifetime less than $1/10^{\text{th}}$ that of the nitrogen 1s hole.