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Inelastic X-Ray scattering as a unique probe of complex materials

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Inelastic x-ray scattering (IXS) has emerged as a powerful new probe of electronic structure and functional properties of wide classes of complex materials. I will discuss our recent results along this direction with focus on Li-battery materials where we have shown how we can obtain unique spectroscopic descriptors for improved battery performance and how the shape of the IXS spectrum can be used to determine Li concentration.[1-5] Notably, IXS is uniquely capable of in situ, in time and in operando studies since high-energy x-rays can easily penetrate closed electrochemical cells. Another example is our work on high-Tc cuprate superconductors where our analysis of the IXS spectrum gives new insight into the nature of the doped holes and the role of the d(z2) orbital in controlling the behavior of low-energy electronic states.[6] I will also comment on the potential of IXS in connection with the hot current area of topological materials.[7] Work supported by the US Department of Energy.

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