Chemistry in Solid-State White Lighting: The Role of Phosphors

I will address inorganic phosphors that play a key role in solid-state white-lighting technologies based on combining a III-nitride-based near-UV or blue solid-state light source with down-conversion phosphors that create longer wavelengths. Experimental studies of some of the best phosphor materials employing state-of-the-art structural tools, have yielded guidelines for what are desirable structural features in efficient phosphors. We find that a useful sorting diagram for efficient hosts with high quantum yield has the band gap of the host – readily calculated with high reliability using hybrid functionals in DFT – as one of the axes, and the calculated Debye temperature as the other axis.