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Effect of Dielectric Response on the Magic Angle Mystery in EELS[1] ADAM SORINI, JOHN REHR, University of Washington, ZACHARY LEVINE, National Institute of Standards and Technology — The "magic" collection angle in electron energy-loss spectroscopy (EELS) is that angle at which the spectra from an anisotropic sample "magically" becomes orientation independent. The "myster"" is that non-relativistic theory predicts a magic angle typically a factor of two too large in modern EELS experiments. Recently it has been shown that a relativistic treatment largely explains the discrepancy [1]. Here, we suggest that the dielectric response of the sample can lead to still larger magic angle corrections for low energy-loss spectra [2]. These dielectric effects are included in a relativistic, independent particle theory using the generalized Lorentz gauge. The effect is illustrated by a calculation of the magic angle including both relativistic and first principles dielectric corrections for graphite and for boron nitride.
[1] P. Schattschneider, C. Hebert, H. Franco, and B. Jouffrey, Phys. Rev. B, 72, 045142 (2005)
[2] A. P. Sorini, J. J. Rehr, and Z. H. Levine (UW Preprint, Nov. 2007)

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