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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Extinction efficiencies of coated absorbing aerosols measured by cavity ring down aerosol spectrometry" *by* A. A. Riziq et al.

Anonymous Referee #2

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This is a nicely written paper outlining some laboratory measurements of optical extinction as a function of size for absorbing particles and coated absorbing particles. The authors make a compelling case that the laboratory proxies they have chosen (nigronsin dye cores with non-absorbing organic coatings) are a reasonable proxy for absorbing aerosol in the atmosphere, which are thought to consist of heterogeneously internally mixed black carbon. The degree to which their Mie scattering calculations are able to reproduce the observed visible extinction should provide a test of the representation of the optical properties of similar particles in atmospheric models. The methodology for the optical extinction measurements has been described in a previous publication from this group, so only the aerosol generation and characterization

apparatus is described here. The experimental approach appears to be reasonable, although the discussion of potential experimental artifacts and associated uncertainties is not as complete is it could be (see below). The conclusion of the work is that the Mie calculations can reproduce the observed extinction for pure absorbing aerosol and thinly coated absorbing aerosol, but that the calculations overestimate (by up to 10%) the extinction of thickly coated particles. The majority of the discussion is devoted to the possible reasons for the discrepancies of the thick-coated particle extinction, although no one single explanation that the authors suggest is sufficient to resolve the discrepancy. Of the six potential explanations, only two (inhomogeneous coatings and non-concentric coatings) give corrections that would reduce the calculated extinction, but neither correction is large enough.

The main weakness of the paper is that the reader is not left with a clear conclusion as to whether these measurements demonstrate the limitations of Mie theory in reproducing extinction efficiency in coated particles or if they rather demonstrate the experimental limitations with this type of measurement. Therefore, as suggested by reviewer #1 and the short comment by A. Khalizov, the authors should undertake a more thorough examination of experimental artifacts. The list suggested in these two comments covers several possibilities, some of which have already been addressed by the authors. I would only add that for completeness, the authors should calculate the heating of the absorbing particles by the CRDS laser beam to further investigate the possibility of coating loss during transit through the extinction cell. Although it is not likely a large effect, the calculation should not be difficult.

Finally, I would encourage the authors to make a more definite statement in the conclusion as to whether the observed discrepancies are more likely experimental artifacts or whether they point to limitations in current models of aerosol extinction.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 18113, 2007.

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Interactive Comment