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On the Development of Tailored Reference Materials for Black Carbon and Light Absorption Measurements

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Perhaps one of the biggest challenges to the quantification of atmospheric black carbon and its impact on air quality and climate is the lack of a universally accepted method for calibrating the numerous methods that are used for measuring the mass and optical properties of BC There have been a number of studies to intercompare the different methods for quantifying organic and elemental carbon (EC/OC) in which aerosol samples taken from the same source were passed between different organizations, using a 'round robin' approach to compare measurements. These studies produced mixed results in that the total carbon measured using different thermal optical techniques was very similar but the subsequent separation into the organic and elemental carbon components led to much larger variation. The same type of studies have been conducted with various optical methods for determining the absorption coefficient of BC but once again the results were variable. The problem in both cases begins with not having an absolute standard that can be accepted as a reference, regardless of the type of measurement.

An alternative approach to producing BC or OC aerosols is to create elemental carbon particles whose structure, i.e. shape, density and solubility, is precisely known and then coat them with organic material of preselected thickness. This presentation will describe this approach and show measurements of these particles with a number of thermal optical, optical and photoacoustic techniques. The preliminary results indicate that this type of approach can offer the means to establish reference standards that could be used as the basis for calibrating all techniques for measuring BC and OC.