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Elemental and isotopic carbon metrology: the critical role of reference materials (RMs) and RM-based intercomparisons

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Reference materials (RMs) and RM-based intercomparisons among expert laboratories continue to serve as critical elements in the advancement of elemental carbon (EC) metrology and isotopic (^{14}C) EC metrology. EC, variously known as Black Carbon and Soot Carbon, has practical importance in the environment as a tracer of fire, as a long term geochemical sink for carbon, and as a climatically active species. Difficulties in measuring, or even defining this important form of matter, created an urgent need for representative RMs; as demonstrated more than two decades ago in interlaboratory comparisons of two NBS "urban dust" reference materials (SRM 1648, SRM 1649) [1]. Similarly, measurement of environmental ^{14}C, especially in atmospheric particles, has become the accepted means for the quantitative apportionment of fossil and biomass carbon. To illustrate some of the measurement challenges, and method dependencies, the talk will focus on the characteristics of selected NIST Standard Reference Materials and information gained through their use in significant interlaboratory comparisons [2,3].

The latter intercomparisons revealed some special method dependencies and potential insights (1) from clusters of EC data-methods, and from comparative chemical (EC, PAH) and isotopic (^{14}C, compound-specific) data for the bulk NIST SRM 1649a (urban dust), and (2) from results for EC in the new atmospheric filter RM 8785 (resuspended urban dust fine fraction). Most recently, the preparation of an hybrid RM ("DiesApple"), consisting of *known amounts* of EC and ^{14}C, made possible the quantitative testing of assumptions involving EC isolation (for isotopic assay) and isotopic purity of the presumed EC fraction [4]. Finally, special, intriguing problems of "low-

level" (atmospheric/cryospheric) EC-^{14}C speciation will be considered, in particular the magnitude and distribution of the carbon blank in studies of remote carbonaceous aerosol.

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