Electron Transfer Methods for Recovery of Giant Fullerenes From Combustion Soot: Increasing the Fullerene Yield by over 50%

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Formation of fullerenes in sooting flames has been demonstrated to be an inexpensive, reliable, and high-yield process for their creation in ton quantities. Twenty percent (or more) by weight of the as-produced combustion soot can be recovered by extracting the soot with aromatic solvents such as toluene. However, mass spectroscopy data show that giant fullerenes, apparently abundant in the as-produced combustion soot, are not recovered by solvent extraction. Here we present an inexpensive electron transfer method that renders the heretofore insoluble giant fullerenes soluble, and allows for their recovery in gram-to-kilogram quantities by reversing the electron transfer. As a consequence, it has been determined that at least 10% of the as-produced combustion soot is giant fullerenes. We will also present preliminary experimental investigations into the physical properties of mixed giant fullerenes in comparison to the toluene-extractable fullerenes, and review the predominant features of the giant fullerenes' molecular electronic structures.