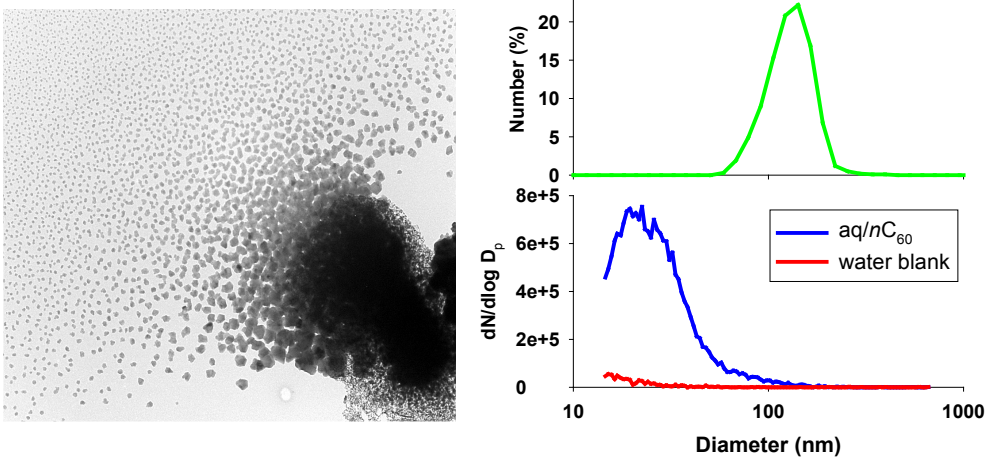
Cross-Media Environmental Transport, Transformation, and Fate of Manufactured Carbonaceous Nanomaterials

Supporting/Contributing Agency: EPA and NSF (CBET-0537117)

Professors Linsey Marr and Peter Vikesland at Virginia Tech have shown that the properties of fullerenes, a model carbonaceous nanoparticle, vary widely with environmental conditions. In aqueous settings, C_{60} fullerenes prepared by extended stirring are far more heterodisperse than those prepared by solvent exchange and appear to form by weathering rather than recrystallization (Duncan et al., 2008). Citrate, known to stabilize many types of nanoparticles in solution, can produce highly ordered aggregate, shown in the left image, of C_{60} with altered crystallinity.



Aerosolization of C_{60} suspensions produces particles that are much smaller than those originally present in solution, as shown in the lower figure; the result suggests that aggregates may readily change size as they are transported from one media to another. Work supported by this grant has also shown that airborne nanoparticles are produced during nanotechnology manufacturing processes (Yeganeh et al., 2008).

References/Publications

Chang, X., Vikesland, P.J., 2009, Effects of carboxylic acids on nC_{60} aggregate formation, *Environmental Pollution*, in press.

Duncan, L.K., Jinschek, J.R., Vikesland, P.J., 2008, C_{60} colloid formation in aqueous systems: effects of preparation method on size, structure, and surface charge, *Environmental Science and Technology*, 2008, 42, 173-178.

Yeganeh, B., Kull, C.M., Hull, M.A., Marr, L.C., 2008, Characterization of airborne particles during production of carbonaceous nanomaterials, *Environmental Science and Technology*, 42, 4600-4606.