Role of White Rot Fungi in the Environmental Fate of C60-Fullerols

Supporting/Contributing Agency: U.S. EPA, NSF

Industrially produced carbon-based nanomaterials (CNM), including fullerenes and nanotubes, will be introduced into the environment in increasing amounts in the next decades. One likely environmental chemical transformation of C_{60} is oxidation to C_{60} fullerol through both abiotic- and biotic-mediated means. Unfortunately, knowledge of the environmental fate of oxidized CNM is lacking.

In a recent study, Schreiner et al. (2009) used bulk and compound specific ^{13}C stable isotope ratio mass spectrometry techniques and spectroradiometry analysis to examine the ability of two white rot basidiomycete fungi (*Phlebia tremellosa* and *Trametes versicolor*) to metabolize and degrade an oxygenated CNM, C_{60} fullerol.

After 32 weeks of decay, both fungi were able to bleach and oxidize fullerol to CO_2. Figure shows three fungal experimental jars after 32 weeks: (jar 1) containing *P. tremellosa* but no fullerol, (jar 2) no fungus control with the dark colored fullerol soaked into the media, and (jar 3) with *P. tremellosa* and fullerol. From the photo it can be seen that the fungus bleached the fullerol. Additionally, the fungi incorporated minor amounts of the fullerol carbon into lipid biomass.

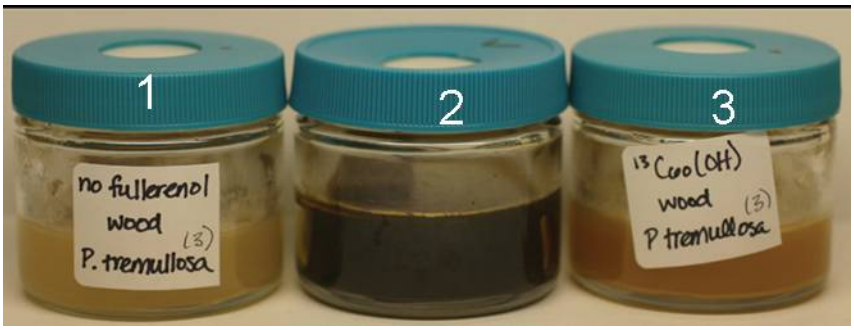

Figure 4.x. *Caption.*

These findings are significant in that they represent the first report of direct biodegradation and utilization of any fullerene derivative and provide valuable information about the possible environmental fates of other CNM.

Reference/Publication

Schreiner, K.M., Filley, T.R., Blanchette, R.A., Bowen, B.B., Bolskar, R.D., Hockaday, W.H., Masiello, C.A., Raebiger, J.W. (2009-in press) White-rot *basidiomycete*-mediated decomposition of C_{60} fullerol. *Environmental Science and Technology*