Green Synthesis of nZVI for Heavy Metal Environmental Health Remediation

Ronaldo H. Franjul[1], Dinorah Martinez[1] and Dr. Carlos R. Cabrera[1]

[1]Department of Chemistry, University of Puerto Rico, Rio Piedras Campus, San Juan, PR 00931.

Las Cucharillas Marsh at Cataño, Puerto Rico, contains soil and water that are significantly polluted by heavy metals such as Cadmium, Arsenic and Lead. The high concentration of these heavy metals found in the Pterocarpus and Mangrove Zone is evidence of the current soil quality in this ecosystem and the health impact to the nearby community. During the course of developing suitable options to treat health related heavy metal contaminants, nano Zero Valent Iron (nZVI) particles have been found to be an alternative approach in reducing the concentration of contaminants in these types of environments. Lead can affect the nervous system and is associated with anemia and kidney cancer, while arsenic can cause bronchitis and esophagus, lung, and bladder cancer. Our main goal is to develop the nZVI Remediation Technology that may lead to novel methods in health treatment of heavy metal poisoning, in addition to environmental remediation. The nZVI uptake of health related toxic metals from the soil may prevent contaminated waters from affecting the communities who supply themselves from these aquatic bodies. An approach to develop nZVI production technology that is greener and cheaper is one of our benchmarks and market competitive edge. It is of our interest to establish a green nZVI synthesis by evaluating different natural extracts such as mango and curry leaves as reducing agents. The nZVI residual nanoparticles will be characterized by different physical and chemical techniques such as ICP, XRD, XPS, HRTEM and SEM. After characterization, the nZVI remediation product will be modified with exfoliated tungsten diselenideas (WSe_2) as a possible anode material for photoelectrochemical solar energy cells.