Green Chemistry at Florida Tech: Education and Research

Education: The Chemistry Department at Florida Tech is currently reviewing its upper division and graduate level course offerings with a view to introducing a Green Chemistry course by Spring, 2011. Green Chemistry will be an advanced course in inorganic/organic chemistry that emphasizes chemistry for a sustainable environment, current clean chemical technology and minimization of waste. The course will cover essential concepts in green chemistry including: Principles of Green Chemistry; Chemical Waste Reduction; Catalysis and Green Chemistry; Solvent Alternatives; Renewable Resources; Green Process Design; Emerging Technologies; Industrial Case Studies. The course will be team taught by Drs. Knight (inorganic), Wehmschulte (inorganic), Nesnas (organic) and Sharma (analytical).

Research: The Knight group has a number of active projects in the field of green chemistry research including: (a) the use of unusual solvent media e.g. ionic liquids for organic transformations (b) development of new water-soluble catalysts for aqueous phase homogeneous catalysis and (c) new reactions involving C1 feedstocks for increased atom efficiency.

Green Chemistry Using Environmentally Benign Iron Compounds

Iron in the +6 oxidation state, commonly called ferrate(VI) has been of great interest because of its role as an oxidant and hydroxylating agent in industrial and water treatment processes, such as the development of a “super iron” battery, green chemistry synthesis, and non-chlorine oxidation/disinfection of aqueous effluents for pollutant remediation. In the laboratory of Dr. Virender Sharma, studies are being conducted to oxidize emerging contaminants such as nitrogen-containing compounds, and pharmaceuticals in water using ferrate(VI).

The contaminants present in water are of great concern because they generate disinfection by-products as well as toxic by-products in treatments using conventional techniques such as chlorination and ozonation. The results have demonstrated that ferrate(VI) can treat most of the contaminants in seconds to minutes with nontoxic by-products. Additionally, ferrate(VI) is also a strong disinfectant to detoxify a wide range of microorganisms including spores, a chlorine resistant species. Tests are also being performed to test ferrate(VI) technology to apply in real-world environmental problems.

This summary is not all-inclusive, other programs exist or are in development among other Chemistry faculty.