COATED GLASS MICROBALLOONS AND SYNTACTIC FOAMS THEREOF FOR ENVIRONMENTAL CLEANUP

K. K. Chawla, University of Alabama at Birmingham
kchawla@uab.edu
G. M Gladysz, Empyreus Solutions, LLC

Key Words: titania, water purification, photocatalysis, syntactic foam

Titania is of great interest to water purification applications mainly because of its nontoxic nature and its photocatalytic properties. In the presence of ultraviolet (UV) radiation (with energy equal to or greater than its band gap (E_G = 3.02 eV) which translates to a wavelength less than or equal to 400 nm) titania exhibits semiconducting properties and creates electron-hole pairs. These electrons and holes give rise to ions, particularly hydroxyl radicals and various superoxides that can be useful in cleaning up a range of organic compounds in their liquid and gaseous phases.

We have developed titania coated glass microballoons (GMBs) with high surface area. These hollow GMBs are made of borosilicate glass, have a density of 0.39 g/cm^3, and an average diameter of 47µm. The objective is to use syntactic foams made of titania coated GMBs for water purification. This materials system is of great interest because it has the potential of a practical material with broad implications for improving the quality and quantity of drinking water. In this work, we describe the processing by sol-gel of titania-coated glass microballoons (GMBs), followed by making a functional foam for environmental applications by sintering. We will highlight the processing of coated GMBs starting with titanium isopropoxide precursor, the microstructure of the coated GMBs, and some critical materials related issues in environmental cleanup applications.