allied academies

International Conference on

Nanomaterials and Nanochemistry

November 29-30, 2017 | Atlanta, USA

Erick R Bandala

Desert Research Institute, USA

Nanotechnology applications for water decontamination and disinfection: Current achievements and further research avenues

Zero-Valent Iron (Fe0) has been shown to detoxify water by creating hydroxyl radicals through Fenton-like reactions combined with hydrogen peroxide (H_2O_2) to get rid of organic contaminants. Nano-sized zero-valent iron (n/ZVI) in combination with oxidants and UV radiation, has been reported can increase the Fenton reaction rate and make water detoxification more effective. In this work, the production of reactive oxygen species, particularly hydroxyl radicals, was assessed for the heterogeneous photo-assisted Fenton-like reaction using nZVI embedded in a mesoporous silica matrix, hydrogen peroxide, and UV-A radiation. The experiments consisted of preparing a 10 µM solution of N, N-dimethyl-p-nitroaniline (pNDA, used as HO• radical probe) in 100 mL of water and adding the silica-embedded nZVI at three different loads (please include loads of Zvi in the SBA-15) with or without H_2O_2, and/or UV-A radiation (λmax=365 nm). The absorbance of the pNDA was measured and compared to that of clear, deionized water. The trials consisted of using immobilized nZVI alone, immobilized nZVI/H_20_2, and immobilized nZVI/H_20_2/UV. From the experimental results, we have seen that the best conditions for hydroxyl radicals production measured as pNDA bleaching are by the combination of immobilized nZVI/H_2O_2/UV despite nZVI, UV-A radiation and hydrogen peroxide alone were capable of bleaching pNDA to a certain extent. The use of the H_2O_2/UV system reached a plateau in hydroxyl radical production after 20 min of reaction. Two kinetic models are proposed to fit experimental data for the different reaction conditions tested and the obtained results were capable of fitting experimental data fairly good meaning that the proposed reaction mechanisms may occur within the reaction mixture to some extent. This novel material found was with interesting capabilities to produce reactive oxygen species, particularly hydroxyl radicals, under photo assisted conditions and high potential for further photocatalytic applications in water treatment.

Speaker Biography

Erick R. Bandala is currently working as, Assistant Research Professor for Advanced Water Technologies at the Desert Research Institute in Las Vegas, NV. Dr. Bandala holds Ph.D degree in Engineering, a Master degree in Organic Chemistry and a B.S. degree in Chemical Engineering. He has been faculty member of the department of Civil and Environmental Engineering (2007-2013) and the Department of Chemical, Food and Environmental Engineering (2013-2015) at Universidad de Las Americas Puebla, Mexico and titular researcher (1993-2007) at the Mexican Institute of Water Technology (belonging to the Ministry of Environment Mexico) in Morelos, Mexico. He has research interests in several different topics related with Environmental Engineering including A) Mechanistic aspects of the use and application of solar driven advanced oxidation processes (AOPs) for environmental restoration B) Development of advanced water and soil treatment for site restoration C) Synthesis, characterization and application of nanomaterials for Indoor Farming systems D) Development of Climate Change adaptation methodologies for water security. As result of his research activities, Dr. Bandala is author or co-author of over 100 international publication including 80 peer-reviewed papers in international journals with high impact index (average impact factor 2.9, >1790 citations, h-index 23); 5 books, 25 book chapters and 65 works published in proceedings of international conferences.

e: erick.bandala@dri.edu

Notes: