OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference on
Nanotek and Expo

December 3-5, 2012 DoubleTree by Hilton Philadelphia Center City, USA

Spectroscopic study of the decomposition of Hydrogen peroxide by Manganese functionalized silicate catalysts

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Manganese functionalized silicate nanoparticles have recently been shown to be a superior catalyst for wet hydrogen peroxide catalytic oxidation. The origin of this exceptional activity of this catalyst arises entirely from manganese incorporated in the silicate framework of the nanoparticles, rather than any presence of manganese oxide particles. We report on extensive spectroscopic studies using inelastic neutron scattering (INS) of the dry decomposition of aqueous hydrogen peroxide by two such Mn silicate catalysts, one of which only contains framework manganese, while the other has mainly extra framework manganese oxide particles. Reactivities and possible reaction paths for the decomposition of H_2O_2 are inferred from an analysis of the INS vibrational spectra along with the assignment of spectral features, which were obtained at three different treatment stages for each catalyst. A molecular level explanation of the greater reactivity of framework manganese may be proposed on the basis of our spectroscopic studies.

Biography

Juergen Eckert is one of the world's leading authorities in the combined application of neutron scattering and computational methods to the solution of important problems in Chemistry. He received his B.S. from Yale University and Ph. D from Princeton University. His scientific activities have been carried out primarily at Los Alamos National Laboratory, the Materials Research Laboratory of the University of California at Santa Barbara, and currently the Department of Chemistry of the University of South Florida as well as many research facilities in the US and Europe.

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