Oral Presentation

Optimizing Photo-Mineralization of Aqueous Methyl Orange by Nano-Zno Catalyst Under Simulated Natural Conditions

Amani Zubi, Ahed Zyoud, Hikmat Hilal
An-Najah N. University, Palestine, Email: amaniz@najah.edu

Photo-degradation of organic contaminants into non-hazardous mineral compounds is emerging as a strategy to purify water and environment. Tremendous research is being done using direct light for these purposes. In this paper we report on optimum conditions for complete mineralization of aqueous methyl orange using lab-prepared ZnO nanopowder catalyst under simulated solar light.

The prepared ZnO powder was characterized using electronic absorption spectra, Photoluminescence emission (PL) spectra, XRD, and SEM. The powder involved a wurtzite structure with ~19 nm particles living in agglomerates. Photo-degradation progressed faster under neutral or slightly acidic conditions, which resemble natural waters. Increasing catalyst concentration increased photodegradation rate to a certain limit. Values of catalyst turn over number and degradation percentage increased under higher light intensity, whereas the quantum yield values decreased. The photocatalytic efficiency of nano-ZnO powders in methyl orange photodegradation in water with solar light has been observed under different working conditions. More importantly, the process may be used under natural water conditions with pH normally less than 7, with no need to use high concentrations of catalyst or contaminant. The results also highlight the negative impact of possible high concentrations of CO_2 on water purification processes. Effects of other added gaseous flows to the reaction mixture are also discussed.

ZnO nano-particles are useful catalyst for complete mineralization of organic contaminants in water. Photo-degradation of organic contaminants with AnO nano-particles, methyl orange being an example, should be considered for future large scale water purification processes under natural conditions.

Key words: Methyl orange; contaminant mineralization; solar simulated light; ZnO Nanopowder