

## Poster Presentation

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### **ZnO/Montmorillonite Nanoparticles as a Photo-degradation Catalyst and Adsorbent for Tetracycline in Water: Synergic Effect in Supported System**

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#### **Abstract**

Extensive use of Antibiotics in human and veterinary medicines has resulted in their frequent detection in soils, groundwater, and wastewater. Adsorption and photo-degradation are among the most effective processes used in purification of water from contaminants such as antibiotics. In this research, we studied the removal of Tetracycline, a common antibiotic, by using pristine ZnO and ZnO/Montmorillonite composite material through two processes: adsorption and photo-degradation. ZnO is a semiconductor photo-catalyst that is used in photo-oxidation of contaminants under solar light to safe products. This is due to ZnO catalyst having low cost, demanding mild reaction conditions, and having high photo-catalytic activity. Montmorillonite, a clay mineral with distinctive physical properties, was known as a good adsorbent of Tetracycline in earlier works. In this work, ZnO was supported on the surface of Montmorillonite, and the composite was used as photo-catalyst under simulated solar light. Adsorption property of this composite material was also studied. XRD and photoluminescence spectra were used to characterize the commercial ZnO, prepared ZnO and prepared ZnO/Montmorillonite. Adsorption process of Tetracycline on ZnO/Montmorillonite was investigated under different conditions such as pH, contact time, amount of Tetracycline, annealing and reaction temperature. Kinetics and adsorption isotherms were studied. The results showed that the adsorption process on a prepared non-annealed

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ZnO/Montmorillonite followed Langmuir isotherm model with adsorption capacity 112.36 mg/g in neutral pH. The adsorption capacity of non-annealed composite material is two folds higher than that for naked Montmorillonite. Most effective adsorption was found in neutral pH medium. Adsorption on both ZnO/Montmorillonite and naked Montmorillonite followed pseudo second order kinetic model. The photo-degradation reaction of Tetracycline was investigated by using commercial ZnO photo-catalyst under different reaction conditions. Under basic conditions, the commercial ZnO showed higher photo- degradation activity under simulated solar light. Effects of different reaction conditions onto photo-degradation reaction of Tetracycline by ZnO/Montmorillonite catalyst were also studied. The higher degradation was achieved in a neutral medium.