Catalytic Adsorption for Intermediate Products

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Introduction

Advanced Oxidation Processes (AOPs) generate powerful oxidizing agents (such as hydroxy radicals) to break down organic materials in water. Ozonation is an AOP that produces hydroxyl radicals. We used solid catalysts (CuO/SiO2, Fe2O3/SiO2, and Mn2O/SiO2) to create a heterogeneous ozonation process. This experiment was designed to examine the effect of adsorption during heterogenous catalytic ozonation.

Adsorption Testing

1. 50 mg of catalyst and 20 mL of model compound were added to 10 beakers.
2. A magnetic stirrer was used to stir the solutions for 30 minutes at 500 rpm
3. Every 5 minutes two beakers were removed and the pH was recorded, as well as a 2 mL sample collected into vials.
4. The sample vials were placed inside an HPLC machine to measure the concentration of the organic compound remaining.

Key Findings

• Less than 6% of all the intermediate products were adsorbed on all three catalysts except for hydroquinone, which was adsorbed around 13% for all catalysts (in deionized water).
• Adsorption and desorption were observed while testing all of the catalysts and mediums.
• These results lend to the idea that the degradation of the intermediate products was mainly due to the catalytic ozonation.

Explanation and Impact

Currently, heterogeneous catalytic ozonation is mostly practiced in the laboratory setting, but with enough research and advancements it can be commercialized to help secure our dwindling water supply. By expanding our knowledge of catalytic ozonation, a greater amount of organic material can be degraded in a cost efficient manner.

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