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Oxidation of dibenzothiophene to dibenzothiophene sulfone using transition metal oxides

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Abstract

In this report we outline the possibility of using two transition metal oxides, molybdenum(VI) oxide and tungsten(VI) oxide as catalysts for the oxidation of sulfur containing compounds in organic solution. Presently, oxidative removal of sulfur from feed stocks can be achieved through the addition of a peroxide or organic acid or a combination of both. However, the oxidation of sulfur in dibenzothiophene can be achieved in organic solution using only molybdenum(VI) oxide and tungsten(VI) oxide without the addition of an organic acid or a peroxide to the reaction mixture. Presently we have been focused on the kinetics and thermodynamics of the reactions for both metal oxides. The present reaction progress was followed using GC-MS, with both metal oxides studied at temperatures from 125-165°C, using a starting concentration of 10,000 ppm DBT. These studies showed that approximately 96-98 percent of the dibenzothiophene is oxidized to dibenzothiophene sulfone. Furthermore from the kinetic studies it was shown that the reactions followed first order or pseudo first order kinetics. In addition, mole ratio studies have shown that the catalysis are effective from 0.05:1 to 1:1 ratio of catalyst: dibenzothiophene with a minimum oxidation observed of 75%. Furthermore, thermodynamic studies showed that molybdenum(VI) oxide and tungsten(VI) oxide had activation energies of approximately 70 KJ/mol.

Biography

Dr. Jason G. Parsons received his Ph.D. in 2003 from the University of Texas at El Paso in Environmental Science and Engineering. In 2009 Dr. Jason G. Parsons joined the Department of Chemistry at the University of Texas-Pan American as an Assistant professor of Chemistry. He has published more than 70 manuscripts in reputed Journals and is a member of the editorial board of the Microchemical Journal.