Oxidation of Sulfide by \( \text{O}_2 \): Catalysis and Inhibition

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Abstract:
Reaction rates between sulfide and oxygen in the presence of extraneous substances were studied. Divalent metal ions and organic substances such as phenols and aldehydes were found to exert accelerating effects. Compounds containing a basic nitrogen with a free electron pair were found to be chain-breakers and to inhibit the reaction. Four types of influence were observed in this study: (1) A shortening or lengthening of the induction period; (2) a change in the stoichiometry of the reaction; (3) a change in reaction rate; and (4) an induced oxidation of the added organic material. It is concluded that the treatment of sulfide-bearing industrial wastewater as well as the oxygenation of sulfide in natural environment can be greatly accelerated through proper use of catalysts.

Subject Headings: Oxidation | Sulfides | Industrial wastes | Metals (chemical) | Phenol | Nitrogen | Organic matter | Wastewater treatment

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It has been recently shown that zinc compounds are effective catalysts for the oxidation of alkyl aryl sulfides to the corresponding sulfoxides in the presence of hydrogen peroxide. In this paper, we have investigated homogeneous and heterogeneous catalytic oxidation of sulfides by \( \text{H}_2\text{O}_2 \) over \( \text{Zn(NO}_3\text{)}_2\cdot6\text{H}_2\text{O} \) and the metal–organic porous material \( \text{[Zn}_2\text{(bdc)(L-lac)}\cdot\text{DMF)} \) (where \( \text{H}_2\text{bdc} = \text{p-benzenedicarboxylic acid, H}_2\text{lacr} = \text{lactic acid} \)), respectively. The experimental data can be explained by the proposed catalytic cycle which includes the activation of \( \text{H}_2\text{O}_2 \) via coordination to \( \text{Zn(II)} \) ions followed b
Inhibitors, on the contrary, increase energy of activation of reaction. In the food-processing industry inhibitors which prevent hydrolysis of fats, reactions of oxidation and fermentation are widely used. There is special case of catalysis - autocatalysis, or acceleration of reaction by one of its products. In this case the rate of reaction does not decrease with the consumption of reagents, but even increase. I.e. the reaction. \[2\text{KMnO}_4 + 5\text{K}_2\text{SO}_3 + 3\text{H}_2\text{SO}_4 = 2\text{MnSO}_4 + 6\text{K}_2\text{SO}_4 + 3\text{H}_2\text{O}\]. accelerates with accumulation of ions Mn2+, formed at the process of reduction of permanganate. Supplementary. The traditional reagents used in oxidation of sulfides to sulfoxides gave mixture of the corresponding sulfoxides and sulfones and also operating condition was difficult. high yields and environmental friendly way.72 mmoles). The procedure described above for the solid-state synthesis of the sulfides to sulfoxides by using Oxone® proved extremely useful. inhibitory activity was measured (in mm) as the diameter of the observed inhibition zones for each organism. R\(\text{Cl}^\text{TM}=\text{C}_6\text{H}_4\text{Cl}(p)\). (c) R=H. Asian J. of them found to have any promising activity. II 408 . and the product was taken up in dichloromethane (3 x 10 ml).22 g. (d) R=H. 1.5 hr. solid state oxidations of aromatic sulfides to the corresponding phenyl and p-tolyl sulfoxides and sulfones using Oxone®. 42: 5833. 46: 4365-4398.