

Influence of Ph and Organics on Autoxidation of S (IV) Catalyzed by Ag (I)



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Abstract

In this paper we report that sodium benzoate works as good inhibitor for SO₂ oxidation in pH range 4.02-5.25 in the presence of Ag(I). Based on the observed results following rate law given and a free radical mechanism have been proposed.

$$d[S(IV)]/dt = (k_1 + k_2[Ag(I)]) [S(IV)]/1 + B [Organics]$$

Keywords: Kinetics; Autoxidation; SO₂; Ag(I); Catalysis; Inhibition ; Aromatic mono carboxylic acid

Introduction

Petroleum hydrocarbons are one of the major pollutants that enter both aquatic and atmospheric systems via oil spills, oil fires, crude oil refining and motor exhaust fumes [1]. Upon the emission of petroleum hydrocarbons into the environment, immediate changes in their chemical and physical properties occur as a result of simultaneous chemical and physical processes including photo degradation evaporation, dispersion and emulsification [2,3]. The photo degradation of petroleum hydro carbons plays a critical role in determining their fate in the environment as a wide variety of photo degradation products such as aromatic/aliphatic acids, alcohols and aldehydes have been identified [4]. The purpose of the present work was to study the influence of sodium benzoate on the Ag (I) catalyzed S (IV) oxidation under the conditions representative for acidic medium.

Experimental

The experimental procedure was exactly the same as described earlier [5]. The reaction mixture was stirred continuously and magnetically at 160±10rpm to allow the passage of atmospheric oxygen and to save the reaction from becoming oxygen mass transfer controlled. The kinetics were followed by withdrawing the aliquot samples periodically and titrating the un reacted S (IV) eudiometrically. The reproducibility of replicate measurements was generally better than 10±1%. All calculations were performed in MS Excel.

Results and discussion

Variation of pH

Variation of pH was carried out from 4.02-5.25 at different [S (IV), Ag(I), [Sodium benzoate] and temperatures. The rate decreases slightly by varying pH is inverse H⁺ ion dependence was observed. From the plot of log k₁v/s log (H⁺) the order with respect to H⁺ is 0.21 which is a fractional order and can be neglected.

[Sodium benzoate] Dependence

To know the effect of sodium benzoate on Ag(I) catalyzed Autoxidation of S (IV) sodium benzoate variation was carried out from 3×10⁻⁷ mol dm⁻³ to 8 × 10⁻⁵ mol dm⁻³ at two different Ag (I) that is 5×10⁻⁶ mol dm⁻³ to 1.0 × 10⁻⁵ mol dm⁻³ but fixed S (IV)=2×10⁻³mol dm⁻³ at pH= 4.95 and t=30 OC. The results indicated that by increasing sodium benzoate the rate becomes decelerates. The Plot of 1/kinhv/s [Sodium benzoate] is linear with intercept 1.01 × 10³s and slope 1.49 × 10⁷mol dm⁻³s from which the value of B = 1.48 × 10⁴ mol dm⁻³.

Conclusion

The following conclusions are deduced from the results of the sodium benzoate inhibited Ag (I) catalyzed Autoxidation of S (IV) was that inhibit the oxidation with the fast influence. The value of Inhibition factor of both un catalyzed and Ag (I) catalyzed Autoxidation of S (IV) in the present study are in the

range of 103 -104 which shows that free radical mechanism is operative.

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