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Studies of oxidation rates of some industrially important cyclic alcohols using KIO₄ in acidic medium

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Oxidation of alcohols by organic oxidants has been widely reported in literature but very few reports are available on the use of inorganic oxidants to oxidize alcohols to the corresponding carbonyl compounds. This paper deals with the first order kinetics of the controlled oxidation of the industrially important cyclic alcohols, Cyclopentanol, Cyclohexanol and Cyclooctanol by KIO₄ in acidic medium. Cyclopentanol is used in the preparation of dyes and pharmaceuticals and Cyclohexanol is used as a feedstock in the polymer industry as a precursor to nylon and plasticizers.

The oxidation rate was monitored by titrimetric analysis of the unreacted inorganic oxidant at regular time intervals. The oxidation rates of the cyclic alcohols increased with alcohol concentration but decreased with oxidant concentration. The thermodynamic activation parameters were determined from the variation of oxidation rate with temperature. A suitable reaction mechanism has been suggested for the oxidation of the cyclic alcohols under study.

The oxidation rates of alcohols follow the sequence: Cyclopentanol > Cyclohexanol > Cyclooctanol which has been explained on the basis of their ring size and stability.

Recent Publications

1. Prabhu DV and Rana Chetana (2019) Kinetic and thermodynamic investigations of the oxidation of Cinnamyl alcohol by some organic oxidants. *Research Journal of Chemistry and Environment* 23(4):27-30.
2. Prabhu DV and Parbat Harichand (2018) A kinetic approach to the oxidation of alcohols by KBrO₃ in acidic medium using transition metal ion catalysts. *Rasayan Journal of Chemistry* 11(3):1349-1356.
3. Prabhu DV and Parbat Harichand (2018) Kinetic and thermodynamic investigations of the oxidation of some industrially important secondary cyclic alcohols by Chloramine T in alkaline medium. *Indo-American Journal of Pharmaceutical Sciences* 5(1):46-51.
4. Prabhu DV and Rana Chetana (2018) Kinetic studies of the oxidation of some perfumery secondary cyclic alcohols using K₂S₂O₈ in acidic medium. *Rasayan Journal of Chemistry* 11(3):1084-1087.
5. Prabhu DV and Parbat Harichand (2018) Kinetics of controlled oxidation of some aliphatic alcohols using Potassium iodate. *Asian Journal of Chemistry* 30(18):2591-2594
6. Prabhu DV and Rana Chetana (2017) Kinetic and thermodynamic studies of the oxidation of perfumery primary acyclic alcohols using K₂S₂O₈ and KIO₄ in acidic medium. *Rasayan Journal of Chemistry* 10(2):385-390.

Biography

D V Prabhu is Adjunct Faculty and Former Head, Department of Chemistry, Wilson College (affiliated to University of Mumbai) Mumbai. His research interests are Reaction Kinetics and Environmental Chemistry. To date, he has published 50 research papers in national and international journals and has 78 presentations to his credit in conferences in India and abroad. He has authored six ISBN books in Physical and Analytical Chemistry.

Dr Prabhu is Editor in Chief, GP Globalize Research Journal of Chemistry (ISSN Print 2581 5911) and Chief Editor, Green Chemistry and Technology Letters (e-ISSN 2455 3611). He is the Founder General Secretary of Association of Chemistry, India's national registered body of Chemistry educators (www.associationofchemistryteachers.org). He is actively involved in the Indian National and International Chemistry and Junior Science Olympiads and has served as Head Mentor and Delegation Leader of the Indian teams to the International Olympiads. He was honoured with the Best Chemistry Teacher Award by Chemical Research Society of India in 2006 and Association of Kineticists of India Award by Indian Chemical Society in 2002.