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Synthesis, characterization and catalytic behaviour of hydrotalcite supported transition metal Schiff base complexes for selective oxidation of alkyl aromatic to ketones

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The oxidation of organic substrates into useful organic compounds is a fundamental reaction in organic chemistry both for basic researches and chemical industries. Recently, significant amounts of transition metal complexes accompanied by Schiff base as ligand have been used as heterogeneous catalysts, due to their high activity, eco-friendly and selectivity. Production of allylic ketones was carried out before by oxidizing the C-H bond using a stoichiometric amount of $KMnO_4$, H_2O_2 and tert-butyl hydroperoxide (TBHP) as oxidizing agents. Selective oxidation of the C–H bonds in ethylbenzene to acetophenone is a field of interest. The production of acetophenone imparts high-value addition because it is used as intermediate for the manufacturing of pharmaceuticals, resins, alcohols, esters, aldehydes, and tear gas and is also used as a component in perfumery. The current industrial production of acetophenone is based on the oxidation of ethylbenzene with molecular O_2 in acetic acid using homogeneous cobalt acetate as the catalyst. This homogeneous method suffers from difficult recovery, lack of reusability and thermal stability. To overcome these disadvantages, heterogenization of the homogeneous catalyst is preferred using various supports. In this context, hydrotalcite supported heterogeneous catalysts have been synthesized by intercalation of transition metal Schiff base complexes. Schiff base complexes, derived from 2-hydroxy-1-naphthaldehyde, 4-aminobenzoic acid, and metal ions, abbreviated as LDH-NAPABA-M {where M=Co, Mn, and Fe} and characterized by XRD, SEM, EDX, AAS, FT-IR, TGA and BET surface area analysis. The catalytic activity of these catalysts has been studied for the oxidation of ethylbenzene using tert-butyl hydroperoxide under solvent-free condition. LDH-NAPABA-Co(II) is found to be the best catalyst among all the catalysts. In all cases, ethylbenzene is oxidized to acetophenone and benzaldehyde. Acetophenone is the major product. LDH-NAPABA-Co is reused six times without significant loss of catalytic activity.

Biography

Savita Khare is a Professor of Organic Chemistry at School of Chemical Sciences, Devi Ahilya Vishwavidyalaya, Indore (M.P.), India. She obtained M.Phil. and Ph.D. degrees in Chemistry from Jiwaji University, Gwalior, India, in 1987 and 1989 respectively. She has published more than 40 papers in reputed international and national journals and has been guided 10 students Ph.D. She is a life-fellow of Indian Science Congress Association, Chemical Research Society of India, Indian Council of Chemists, Catalysis Society of India and Society of Materials Chemistry. Her research interests include synthesis of supported and non-supported catalysts of transition metal complexes, mechanistic studies of reactions, viz. epoxidation, hydroxylation, oxidation, catalyzed by heterogeneous transition metal complexes, development of new reagents for the oxidation of a variety of organic molecules.

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