**Greener and Sustainable Alkene Epoxidation Process**

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Epoxides are key raw materials or intermediates in organic synthesis, particularly for the functionalisation of substrates and production of a wide variety of chemicals such as pharmaceuticals, plastics, paints, perfumes, food additives and adhesives. The conventional methods for the industrial production of epoxides employ either stoichiometric peracids or chlorohydrin as an oxygen source. However, both methods have serious environmental impact as the former produces an equivalent amount of acid waste, whilst the later yields chlorinated by-products and calcium chloride waste. There has been considerable effort to develop alternative alkene epoxidation methods by employing an oxidant such as *tert-*butyl hydroperoxide (TBHP) as it is environmentally benign, safer to handle and possesses good solubility in polar solvents. However, homogenous catalysed alkene epoxidation has several drawbacks including deposition of catalyst on the reactor walls and increased difficulties in separation of catalyst from the reaction mixture. In this work, an efficient and selective polystyrene 2-(aminomethyl)pyridine supported molybdenum complex (Ps.AMP.Mo) and a polybenzimidazole supported molybdenum complex (PBI.Mo) have been used as catalysts for epoxidation of 4-vinyl-1-cyclohexene (i.e. 4-VCH) using TBHP as an oxidant in batch and continuous reactors. An extensive assessment of the catalytic activity, stability and reusability of the catalysts has been conducted in a classical batch reactor. Experiments have been conducted to study the effect of reaction temperature, feed molar ratio of alkene to TBHP and catalyst loading on the yield of 1,2-epoxyhexane and 4-vinyl-1-cyclohexane 1,2-epoxide (4-VCH 1,2-epoxide) to optimise the reaction conditions in a batch reactor. Furthermore, the efficiency of the heterogeneous catalyst for continuous epoxidation studies have been assessed using a FlowSyn continuous flow reactor, which has shown considerable time savings, high reproducibility and selectivity along with remarkable improvements in catalyst stability compared to reactions carried out in a batch reactor.

**Keywords**: *alkene epoxidation, tert-butyl hydroperoxide (TBHP), epoxides, polymer supported Mo(VI) catalysts, 4-vinyl-1-cyclohexene.*