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**Title:** Greener and efficient epoxidation process for the synthesis of commercially important epoxides

Epoxides are highly reactive intermediates used to make commercially important products like plasticizers, flavours, perfumes, and drugs. In conventional epoxidation processes, peracids such as peracetic acid, *m*-chloroperbenzoic acid, or chlorohydrin are commonly used as oxidising reagents, which are not environmentally friendly due to the formation of acid wastes and chloride waste. Alkene epoxidation process with *tert*-butyl hydroperoxide (TBHP) as an oxidising reagent by using heterogeneous Mo (VI) catalyst is environmentally friendly process. However, despite numerous published works on polymer-supported Mo (VI) catalysts in the epoxidation of different alkene substrates, there appears to be no report yet on the epoxidation of 1,5-hexadiene with *tert*-butyl hydroperoxide as an oxidising reagent in the presence of polymer-supported Mo (VI) catalyst.

In this study, a polymer-supported Mo (VI) heterogeneous catalyst will be used for the epoxidation of 1,5-hexadiene and other suitable alkene in presence of TBHP oxidant in batch and continuous processes.

The current research has been successfully prepared and characterised polybenzimidazole supported Mo (VI) complex, i.e., PBI.Mo for the epoxidation of 1,5-hexadiene. The effects of different parameters such as reaction temperature, feed mole ratio of 1,5-hexadiene to TBHP, catalyst loading, and reaction time were studied to evaluate the catalytic performance. Response surface methodology (RSM) using Box-Behnken Design (BBD) was employed to study the interaction effect of different variables on the reaction response.

The optimisation result from the batch studies has been validated experimentally resulting in an epoxide yield of 62.03%, which shows the adequacy of the predicted optimum conditions with a 3.5% relative error from the experimental results.

The catalytic performance of PBI.Mo will be evaluated by continuous epoxidation of 1,5-hexadene in the following phase of the study.