

Utilization of waste tyres pyrolysis oil vapour in the synthesis of Zeolite Templated Carbons (ZTCs) for hydrogen storage application

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ABSTRACT:

In this study, we investigated the potential for use of waste tyre pyrolysis oil vapour as a carbon precursor in the synthesis of zeolite templated carbons (ZTC). With Zeolite 13X as the template, the ZTCs were synthesised using two methods namely: 1-step process which involved the carbonization of gaseous carbon precursor in the zeolite template (in this case, ethylene and pyrolysis oil vapour) and the 2-step synthesis method involved the impregnation of zeolite pores with furfural alcohol prior to carbonization of the gaseous carbon precursor. The replication of the zeolite 13X structural ordering was successful using both methods. The 2-step synthesized ZTCs were found to possess the highest specific surface area ($3341 \text{ m}^2 \text{ g}^{-1}$) and also had the highest H_2 storage capacity (2.5 wt.%). The study therefore confirmed an additional novel strategy for value-addition of waste tyre pyrolysis by-products.