Furfural production with MPr-SO$_3$H-KIT-6 mesoporous catalyst via xylose dehydration process

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Abstract: In this research, the furfural was catalytically produced through xylose dehydration process, using mesoporous sulfonic acid catalysts (KIT6-MPr-SO$_3$H). The catalyst was synthesized via a simple one pot method (co-condensation and oxidation). The structural characteristics of KIT-6 catalyst were systematically investigated, using X-ray powder diffraction (XRD), transmission electron microscope (TEM), Fourier transform infrared spectroscopy (FT-IR), N$_2$ adsorption–desorption isotherms and NH$_3$ temperature programmed desorption (NH$_3$-TPD). The xylose dehydration process was studied over mild conditions of a biphasic mixture of toluene and an aqueous solution of xylose. Effects of reaction temperature, reaction time and catalyst loading were investigated. Our results showed the highest xylose conversion and furfural selectivity of 94.6% and 98.4%, respectively, at 170°C, 2 h of operating time, with 25 wt.% catalyst loading.

Keywords: KIT-6-SO$_3$H catalyst; Mesoporous silica; Furfural; Xylose dehydration