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Mesoporosity development in zeolite beta by using desilication and CTAB assembly for removal of Mn^{2+}

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ABSTRACT

Mesoporous zeolite beta (Si/Al = 25) was synthesized in an aqueous 2–7 M NaOH solution and cetyltrimethylammonium bromide (CTAB) (0.18 M) solution to form mesopores via the extraction of framework silicon and surfactant assembly. The physicochemical properties of the mesoporous zeolites beta were then analyzed using X-ray diffraction, nitrogen full isotherms at 77 K, scanning electron microscopy, transmission electron microscopy, ^{29}Si-nuclear magnetic resonance, and Fourier transform infrared spectroscopy. The commercial zeolite beta, –Si–O–Al–, and –Si–O–Si– linkages were broken due to the NaOH process. Micelles formed by CTAB then lead to the formation of mesoporosity with zeolite beta character. This material, which introduces mesoporosity into zeolite beta, displayed a superior adsorption capacity than commercial materials when used as an adsorbent for manganese removal.

Keywords: Mesoporosity; Desilication; CTAB; Zeolite; Zeolite beta; Water treatment; Manganese

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