عنوان مقاله:

Preparing hierarchical nanoporous ZSM-5 zeolite via post-synthetic modification of zeolite synthesized from bagasse and its application for removal of Pb^{2+}

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خلاصه مقاله:

In this study, hierarchical H-ZSM-5 zeolite is prepared via post-synthetic modification of parent H-ZSM-5 zeolite (Si/Al=35) synthesized from bagasse (BGA) as silica source using desilication with alkaline treatment (AT). For optimizing the effective parameters on desilication, Taguchi method was utilized. Cultivated BGA in the south of the Caspian Sea (Mazandaran province, Iran) is applied for extracting silica powder and used in the synthesis of zeolite. In this work, two responses have been considered. The First and the second responses are the maximum amounts of extracted silicone and the removal of Pb^{2+} % from aqueous solutions, respectively. For this purpose, the effect of four important factors with three selected levels including; concentration of NaOH solution (0.1, 0.2 and 0.5 M), temperature (25, 55 and 85 Cº), time of reflux (30, 60 and 120 min) and molar ratio of TMAOH/ NaOH (0.5, 1 and 1.5) are studied on both of the responses. TMAOH was defined as tetra methyl ammonium hydroxide. According to Taguchi method, the optimum conditions for both responses are concluding as Concentration of NaOH solution=0.2 M, temperature =55 Cº, time of reflux=120 min and molar ratio of TMAOH/ NaOH=0.5. The results display that Concentration of NaOH solution in comparison to other factors is the most effective one in both responses. Also, AT-05-ZSM-5 is selected as the optimum zeolite with volumes 278.13 ppm and 90.2 % with S/N ratios 48.878 and 39.097 for the first and the second responses, respectively. Parent H-ZSM-5 and AT-05-ZSM-5 are characterized by x-ray diffraction (XRD), scanning electronic microscopy (SEM), Fourier transform infra-red (IR), Brunauer–Emmett–Teller (BET), Barrett-Joyner-Halenda (BJH) and inductively coupled plasma-optical emission spectrometery (ICP-OES). AT-05- ZSM-5 demonstrates a limit and uniform meso-pore average size distribution at 7.65 nm using alkaline treatment.

کلمات کلیدی:

Bagasse+, ZSM-5 zeolite, hierarchical ZSM-5 zeolite, desilication, Taguchi method, removal of Pb^{2+}