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SYNTHESIS OF NANO-SIZED CU-ZEOLITE USING A NEW MICROWAVE ASSISTED METHOD

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Zeolites are mesoporous materials that have various applications, such as water purification and catalytic processes. Due to their tunable properties, such as high porosity, large surface area, ion exchanging ability and high thermal stability, zeolites have attracted the attention of scientists to enhance the catalytic action of the material in a variety of applications. During this project, zeolite was modified to be used as a catalyst in removal of NO_x and SO_2 from vehicle exhaust. Modification of zeolite was performed using $Cu(NO_3)_2$ via a microwave assisted method, and the resulted samples were characterized by fourier transform infrared spectroscopy (FTIR), powder X-ray diffraction (PXRD) and particle size analysis. Since the PXRD pattern of the synthesized zeolite and the modified samples have similar peak positions, the crystal structure of the modified zeolite can be considered as conserved up to a certain level when modified. However, modified samples show a decrease in the intensity of peaks due to the high absorption coefficient of Cu compounds in Cu-zeolite for X-ray radiation. Additional peaks in the PXRD pattern of Cu-zeolite at 35.50° and 38.61° are characteristic peaks for CuO which does not appear in the PXRD pattern of synthesized zeolite. The results obtained show that the synthesized zeolite has LTA (Linde Type A) crystal structure. According to the FTIR data, there is a peak around 1,383 cm^{-1} in the spectra obtained for Cu-zeolite which is not present in the synthesized zeolite. This is an indication of variable amounts of Cu present in the ion exchange sites by replacing the proton in the Cu-zeolite. The band that appears at 3,443.73 cm^{-1} in Cu-zeolite spectrum is due to the Cu-O vibrations and it is not observed in the synthesized zeolite. Synthesized zeolite had a narrow particle size distribution with an average size 300-600 nm. Unlike other methods, the microwave assisted method of zeolite modification was carriedout at a temperature as low as 110 °C and nano-sized LTA type zeolite was successfully obtained.

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