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OPTOMIZATION OF PROCESS PARAMETERS FOR H_2S ADSORPTION USING Z_NO/SBA-3 AND RSM

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Abstract: H_2S is a major toxic compound that could be found in air, water, Fossil fuels and causes some worth effects such as acidic rain and corrosion. Therefore, removal of H_2S is important issue from environmental and industrial point of view. In the present work SBA-3 (SantaBarbarA University no. 3) with three different weight percent's of ZnO, i.e. 5%, 10% and 15% was synthesized via an in situ approach. All synthesized samples were characterized using atomic absorption spectrometry, X-ray diffraction (XRD), nitrogen adsorption and transmission electron microscopy (TEM). The obtained results from XRD and nitrogen adsorption confirmed that all the samples almost retained their ordered structure after incorporation of ZnO nanoparticles within the mesopores of SBA-3. TEM images show that ZnO nanoparticles arranged along the direction of mesopores of SBA-3. After that, adsorption of H_2S from a model gas (5000 ppm of H_2S in helium) was investigated via response surface methodology (RSM). A three factor Box–Behnken design with five center points and one response was performed for the evaluation of effect of three process parameters, i.e. ZnO wt%, space velocity and temperature on the adsorption of H_2S. Response surface methodology (RSM) was applied for optimizing the adsorption of H_2S and a quadratic model was developed. Among the factors, temperature had the largest and space velocity had the lowest effect on the breakthrough of H_2S. The model had r^2 0.9185 indicates that this model can be used to navigate the design space. At optimum condition which obtained from the model, the obtained breakthrough time (t_{bp}) was 588 min.

Keywords: Air pollution; H_2S; Mesoporous materials; Removal; Zinc oxide.