

Jordan University of Science and Technology

Sulfur Dioxide Removal using Natural Zeolitic Tuff

Authors: Mohammad Al-Harashseh , Reyad Shawabkeh, Marwan Batiha,
Adnan Al-Harashseh, Kamel Al-Zboon

Abstract: Adsorption of SO₂ onto Jordanian zeolitic tuff (ZT) was examined in this work. ZT samples were characterized by XRD, XRF, BET and TGA analyses. The sorption process was carried out in a fixed bed column at different operating conditions. The unique measuring technique, namely UIC sulfur coulometer, for SO₂ measurement was adopted in this work. Uptake of SO₂ by ZT was found to increase with increasing temperature up to a temperature of 200 °C and then decrease at higher temperatures. It was also found that drying of ZT, by conventional and microwave heating has a considerable effect on SO₂ uptake and breakthrough time. Experimental data for adsorption isotherms were obtained and found to follow the BET isotherm model. It was found that the adsorption process is exothermic in nature. Thermal pre-treatment was found to affect the adsorption capacity and breakthrough time of ZT. The maximum adsorption capacity was obtained after thermal pretreatment of ZT at a temperature of 200 °C, which could be linked to the effect of heating on the destruction of crystal structure of phillipsite, the crystal refinement of chabazite, and the formation of new aluminosilicate crystalline phases. ZT can be regenerated and the initial adsorption capacity was preserved after three regeneration cycles.