Effect of different pluronic p123 triblock copolymer surfactant concentrations on sba-15 pore formation

Donanta Dhaneswara, author

Abstrak

Santa Barbara Amorphous-15 (SBA-15) is an interesting mesoporous silica material with highly ordered nanopores and a large surface area. Due to its unique properties, this material has been widely employed in many areas. This study aimed to predict the number of nanopores per gram of SBA-15 material based on an optimum value of surfactant addition at the desired number of nanopores. For this purpose, SBA-15 was synthesized via a sol-gel process using tetraethyl orthosilicate (TEOS, Si(OC2H5)4) as a precursor and pluronic P123 triblock copolymer surfactant (EO20PO70EO20, EO = ethylene oxide, PO = propylene oxide) as a template. There were five different surfactant concentrations, namely 0.35, 2.50, 2.70, 3.00, and 3.30 millimoles, used with a fixed concentration of TEOS. The characterization was performed using small-angle x-ray scattering (SAXS), adsorption-desorption (BET), and transmission electron microscopy (TEM). The results showed that the surfactant concentration did not affect the crystal structure, although an increase in the surfactant concentration linearly correlated with an increase in the surface area. The shape and size of the pore diameter tends to be approximately 3 nm, as characterized using BET adsorption-desorption. The optimum concentration of surfactant for the formation of mesoporous SBA-15 material was 2.70 millimoles. The value obtained in this study was in accordance with the calculated value, indicating that the theoretical calculations can be used to experimentally predict the number of pores.