SYNTHESIS AND CHARACTERIZATION OF MESOPOROUS ZEOLITE FROM COAL FLY ASH FOR BIO-OIL PRODUCTION

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ABSTRACT

Coal fly ash, which contains the high amount of silica and alumina content, discharged from the coal electric power plants is one of the by-product of thermal power generation that could be used as a precursor for the production of zeolite-based catalysts. Coal fly ash could be a more cost-effective alternative to synthetic zeolite since it is abundant around the world. Coal fly ash was used to synthesize mesoporous zeolite by alkali fusion followed by hydrothermal treatment. This study focuses on the synthesis and characterization of mesoporous zeolite. The raw materials were treated with alkaline using hydrothermal and fusion methods. Hydrothermal was performed at a temperature of 160 °C for 24 h in a stainless steel autoclave. The synthesized zeolite was characterized using various techniques such as Fourier Transform Infrared (FTIR), Scanning Electron Microscopy-Energy Dispersive X-ray Analysis (SEM-EDX) and Brunauer, Emmett, and Teller (BET) method for surface area measurement, pore volume and pore size. The results indicated that the synthesised zeolite derived from coal fly ash demonstrated the characteristics of zeolite-like materials. The maximum surface area of the synthesised zeolite was found to be 42.2719 m2/g with high purity. The SEM observations of grain shapes revealed that the synthesised zeolite was composed of isometric and octahedral crystals proving that the synthesis process was successful. The existence of the two most intense bands for zeolites which was the internal tetrahedron vibrations of Si-O-Si and Si-O-Al implies zeolite formation.