

UNIVERSITI TEKNOLOGI MARA

SODIUM SILICATE EXTRACTION
FROM SUGARCANE BAGASSE ASH
(SCBA) VIA THERMO CHEMICAL
TREATMENT FOR SYNTHESIS OF
SANTA BARBARA AMORPHOUS-15
(SBA-15)

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ABSTRACT

This study explores the potential of sugarcane bagasse ash (SCBA) as a precursor in the production of Santa Barbara Amorphous-15 (SBA-15) in order to determine the effect of temperature and time of the pyrolysis towards silica content. In this study the sugarcane bagasse (SCB) was pyrolysed at three different temperatures which are 600°C, 800°C and 1000°C for 2 hours, 3 hours and 4 hours. The ash was then washed with hydrochloric acid (HCl) to remove impurities and characterised using X-ray fluorescence (XRF). The study indicates that the amount of silica in SCBA at 1000°C and 4 hours gave the highest silica content which is 88.13%. Next, the ash with the highest silica content was used in the extraction of sodium silicate (Na₂SiO₃) by using sodium hydroxide (NaOH). The formation of sodium silicate was characterised using Fourier Transform Infrared Spectroscopy (FTIR) and Inductive Coupled Plasma (ICP) to validate the silica content in the sodium silicate obtain. The FTIR pattern and ICP result has shown that the extracted sodium silicate gave a high silica concentration which is about 4873 ppm. Furthermore, the application, SBA-15 was synthesised using the extracted sodium silicate. Mesoporous silica, SBA-15 was prepared using extracted sodium silicate as the silica source and PI23 surfactant as the template. The SBA-15 formed was characterised using X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Bruanauer-Emmett-Teller (BET) and Field Emission Scanning Electron Microscopy (FESEM). From the XRD analysis, SBA-15 obtained shows the characteristic of 2-D hexagonal mesoporous material at peak (100), (110), and (200) reflections associated to 2-D hexagonal with p6mm symmetry which indicate the mesoporous structure. The clear formed of mesoporous pore aligned uniformly. The pore dimensions estimated around 2.3 μ m to 781 nm with particle diameter approximately 80 nm to 251 nm, also with the large surface area, 466 m²/g. Therefore, mesoporous SBA-15 synthesised exhibited the similar morphology as commercial SBA-15.

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