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Synthesis of Mesoporous Silica Using Gelatin as a Template and Cr/silica Catalyst For Hydrocracking of Waste Lubricant Oil

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Abstract : Extraction of gelatin from bovine bonewas carried outusing a combined method of acids and bases. The gelatin was extracted from the bone using a solution of 4% acetic acid for 3, 6, and 9 days, 0.1 M sodium hydroxide for 24 h and 1.0 M hydrochloric acid for 1 h. The gelatin was characterized by electrophoresis and infra red (FTIR). The mesoporous silica (SM) was synthesized by adding a solution of TEOS as silica source into the gelatin solution and stirred for 24 h. The formed gel solution was filled intoan autoclave and hydrothermally treated at 100 °C for 24 h. The products was then calcined at 550 °C for 5 h. The silica was characterized by FTIR, x-ray diffraction (XRD), transmission electron microscope (TEM), gas sorption analysis (GSA) and acidity test. The silica wasthen poured into a solution of Cr salt precursor ($Cr(NO_3)_3 \cdot 5H_2O$) for 24 h, thendried and reduced with H_2 gas to obtain Cr/SM catalyst. The Cr/SM catalystwas characterized by scanning electron microscope (SEM-EDS), GSA and acidity test as well as the activity test in the hydrocracking of waste lubricant oil. The weight ratio of lubricant/catalystwas25, 50, and 75 wt. %. The liquid product of hydrocracking was analyzed by gas chromatograph-mass spectroscopy (GC-MS).The results showed that the gelatin consisted of α chain collagen in weight distributionof 83-182 kDa. Thesilica shown a wormhole-like pore with avarage diameter of 3.42 nm, specific surface area of 279.06 m^2/g, and pore volume of 0.46 cm^3/g. The Cr/SM catalyst has pore diameter, specific surface area, pore volume of 3.41 nm, 233.77 m^2/g and 0.42 cm^3/g, respectively. The hydrocrancking of lubricant in a lubricant/catalyst ratio of 75produced highest liquid products of 37.12 wt.%with selectivity for gasoline and diesel oil fraction was 13.73and16.90 wt.%.
Keywords: gelatin, mesoporous-silica, hydrocracking, waste lubricant.

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