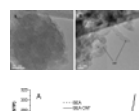
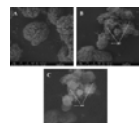
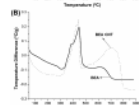
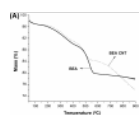
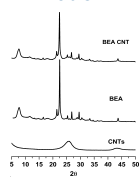


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Full Length Article

Vacuum gas-oil hydrocracking performance of Beta zeolite obtained by hydrothermal synthesis using carbon nanotubes as mesoporous template

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Highlights

- Beta zeolite was synthesized with carbon nanotubes as mesoporous template.
- Carbon nanotubes produces an increase of mesoporosity and a decrease of total Brønsted acid sites in the resulting zeolite.
- NiMo catalysts, including different ratio zeolite–alumina, were evaluated for hydrocracking of Colombian vacuum gas oil.
- Beta with carbon nanotubes composite catalysts have greater conversion than zeolite without carbon nanotubes.

Abstract

Beta zeolite was synthesized under hydrothermal conditions using multi-walled carbon nanotubes with an outer diameter of 8–15 nm as a nanometric template. The textural, structural, and acidic properties were characterized by X-ray diffraction, thermogravimetric and differential thermal analyses, chemical analysis, N₂ physisorption, scanning and transmission electron microscopies, ²⁷Al solid-state nuclear magnetic resonance, and infrared spectroscopy of adsorbed pyridine. Ni–Mo hydrocracking catalysts were prepared from the calcined zeolites. Their catalytic performance was evaluated by hydrocracking heavy vacuum gas oil. Results indicated that adding carbon nanotubes to the synthesis gel produces a substantial increase of mesoporosity in the obtained Beta zeolite. This resulted in a decrease of the total Brønsted acid sites, particularly those of higher acid strength. The most active hydrocracking catalyst was the one prepared with the zeolite synthesized using carbon nanotubes. For the same conversion level, selectivity to middle distillates and naphtha increased with the concentration of strong acid sites in the catalysts.

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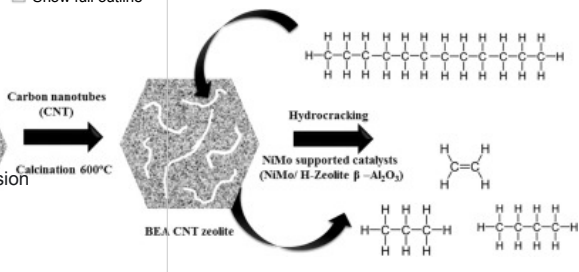
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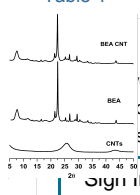


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Zeolite; Carbon nanotubes; Hydrocracking; Vacuum gas oil; Physicochemical properties; Brønsted acid sites

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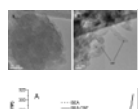
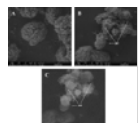
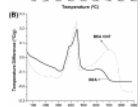
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