Catalytic upgrading of pyrolysis vapor from rape straw in a vacuum pyrolysis system over La/HZSM-5 with hierarchical structure

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Catalytic upgrading of pyrolysis vapor from rape straw in a vacuum pyrolysis system over La/HZSM-5 with hierarchical structure

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Abstract: Catalytic upgrading of pyrolysis vapor from rape straw was performed in a vacuum pyrolysis system over La/HZSM-5 with hierarchical structure. When 3M Na_2CO_3 was used for alkali treatment, the desilication process of HZSM-5 zeolite was highly controllable and the hierarchical porous HZSM-5(Hi-ZSM-5) zeolite was formed. After that, Hi-ZSM-5 was modified by impregnation with lanthanum ion, the acid sites of Lewis increased and the concentrations ratio of Brönsted acid and Lewis acid of the catalyst was improved. The highest hydrocarbons selectivity (49.86%), the lowest carbonyl compounds content (11.06%), and reasonable catalytic stability were obtained by the La/Hi-ZSM-5 catalyst. In addition, La/Hi-ZSM-5 further reduced the coke content of the catalyst to 11.05%, while increasing the selectivity of high value aromatic hydrocarbons. Obviously, La/Hi-ZSM-5 zeolite had high catalytic activity, and exhibited good potential and a beneficial nature for efficient preparation of high-valued bio-oil from rape straw.

Keywords: Rape straw; In-situ upgrading; Bio-oil; Hierarchical HZSM-5; La

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