In situ catalytic upgrading of oxygenated pyrolysis vapours from pyrolysis of sugarcane bagasse over metal oxides loaded HZSM-5

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ABSTRACT

The main objective of the current work is to study the performance of the NiO and Ce_2O_3 loaded HZSM-5 catalyst on the catalytic upgrading of oxygenated pyrolysis vapours from sugarcane bagasse into high-quality pyrolysis oil consisting of C_6–C_8 hydrocarbons. The experiments were performed at five different pyrolysis reaction temperatures (400, 450, 500, 550 and 600 °C) via in situ fixed bed reactor. The HZSM-5 was used as a support, while nickel oxides and/or cerium oxides were impregnated via incipient wetness impregnation method. The catalyst-to-biomass mass ratio was kept constant at 1:1 for all investigated samples. The results revealed that the NiO-Ce_2O_3/HZSM-5 catalyst has synergistic effects on upgrading the oxygenated pyrolysis vapours into higher contents of C_6–C_8 hydrocarbons (8.82%) in pyrolysis oil at 500 °C compared with other investigated catalysts.

KEYWORDS

Biomass pyrolysis; BTX; Catalytic upgrading; HZSM-5; NiO; Ce_2O_3; C_6–C_8 hydrocarbons

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