Increased Aromatics Formation by the Use of High-Density Polyethylene on the Catalytic Pyrolysis of Mandarin Peel over HY and HZSM-5

Catalysts 8 (2018) 656

Abstract:
High-density polyethylene (HDPE) was co-fed into the catalytic pyrolysis (CP) of mandarin peel (MP) over different microporous catalysts, HY and HZSM-5, with different pore and acid properties. Although the non-catalytic decomposition temperature of MP was not changed during catalytic thermogravimetric analysis over both catalysts, that of HDPE was reduced from 465 °C to 379 °C over HY and to 393 °C over HZSM-5 because of their catalytic effects. When HDPE was co-pyrolyzed with MP over the catalysts, the catalytic decomposition temperatures of HDPE were increased to 402 °C over HY and 408 °C over HZSM-5. The pyrolyzer-gas chromatography/mass spectrometry results showed that the main pyrolyzates of MP and HDPE, which comprised a large amount of oxygenates and aliphatic hydrocarbons with a wide carbon range, were converted efficiently to aromatics using HY and HZSM-5. Although HY can provide easier diffusion of the reactants to the catalyst pore and a larger amount of acid sites than HZSM-5, the CP of MP, HDPE, and their mixture over HZSM-5 revealed higher efficiency on aromatics formation than those over HY due to the strong acidity and more appropriate shape selectivity of HZSM-5. The production of aromatics from the catalytic co-pyrolysis of MP and HDPE was larger than the theoretical amounts, suggesting the synergistic effect of HDPE co-feeding for the increased formation of aromatics during the CP of MP.

* Excerpted from online journal website (Click the title)

Frontier Labs Products used:
Multi-Shot Pyrolyzer EGA/PY-3030D, UA+-5, F-Search