Production of BTX via Catalytic Fast Pyrolysis of Printed Circuit Boards and Waste Tires Using Hierarchical ZSM-5 Zeolites and Biochar

C. Ma, S. Kumagai, Y. Saito, T. Kameda, A. Watanabe, C. Watanabe, N. Teramae. T. Yoshioka

ACS Sustain. Chem. Eng. 2022, 10, 14775−14782

Abstract:

The conversion of plastic wastes into benzene, toluene, and xylenes (BTX) is a promising strategy to achieve a circular economy and carbon neutrality. Here, the *ex-situ* catalytic fast pyrolysis of epoxy-printed circuit boards (PCBs) and waste tires (WTs) was studied using hierarchical ZSM-5 zeolites and biochar (BC). The results show that the alkali–acid treatment created the micromesoporous structures of zeolites with higher specific surface area, and the hierarchical zeolites promote BTX formation. Particularly, the ZSM-5 treated with 0.2 M NaOH (2MZ) resulted in a BTX yield 15.6 times larger than that obtained without catalysts; correspondingly, the yields of phenolic and brominated compounds were reduced. The BC promoted the depolymerization of PCB pyrolyzates and provided a debromination efficiency of 96 %. The combination of BC and 2MZ resulted in the highest BTX yield without producing brominated compounds. Sequential experiments indicated that, by effectively removing bromine, BC helped maintain the catalytic activity of 2MZ. Additionally, the catalytic fast copyrolysis of PCBs and WTs resulted in an increased BTX yield and mitigated catalytic deactivation simultaneously. The proposed advanced catalytic fast copyrolysis with BC and hierarchical zeolites is a promising strategy for the environmentally friendly upcycling of heteroatom-containing plastic wastes toward BTX production.

* Excerpted from online journal website (Click the title)

Frontier Labs Products used:

Rx-3050TR