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Full Length Article

Prevention of CaO deactivation using organic calcium precursor during multicyclic catalytic upgrading of bio-oil

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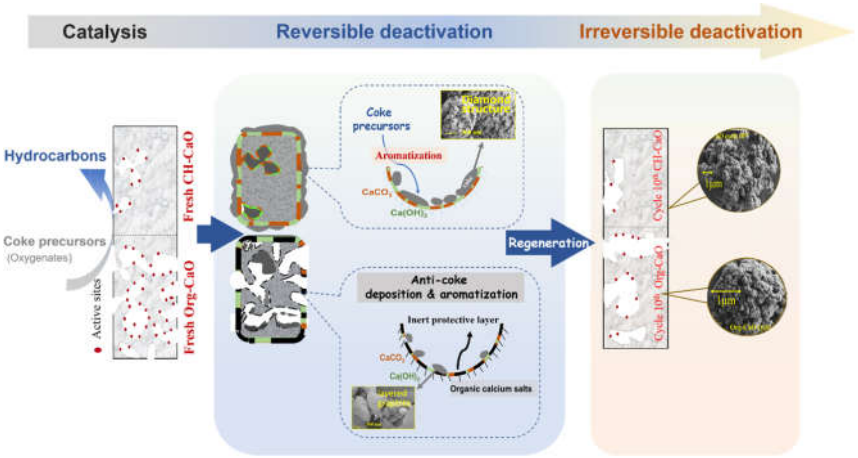
GRAPHIC ABSTRACT



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ABSTRACT

The conversion of biomass wastes into upgraded bio-oil has been successfully implemented by catalytic fast pyrolysis (CFP) with CaO catalyst. The bottleneck of CFP technology is catalyst deactivation. Ex-situ catalytic pyrolysis of biomass wastes with multiple recycling of CaO from different calcium precursors were performed in a continuous fixed-bed at 500 °C. The objectives were to intensify the anti-deactivation and regenerative stability of CaO using organometallic precursor, and comprehensively distinguish the effects of calcium precursors on deactivation mechanism in terms of coke yield, coke species, structural and chemical changes et al. The results demonstrated that organic calcium precursor strengthened the recyclability of CaO catalyst during upgrading of bio-oil by showing longer lifetime and better recycling stability. Compared with conventional CaO from $Ca(OH)_2$ (CH-CaO), the stronger deoxygenation and superior porosity of CaO from organic calcium precursors (Org-CaO) facilitated the removal of coke precursors and suppressed pore plugging. The average coke yields of CH-CaO and Org-CaO were respectively 5.1 and 2.2 g/m^2. Moreover, CH-CaO promoted the aromatization of coke precursors, leading to coke existing in form of hard diamond-like structure. But coke deposited on Org-CaO exhibited softer

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