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Efficiency and mechanism of phenacetin decomposition in Al_2O_3 supported Ni–Co layered double hydroxides catalytic ozonation

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ABSTRACT

In this research, Ni/Co/Fe 2D nanosheets-crosslinked frameworks (Ni–Co LDHs, Ni–Fe LDHs, Co–Fe LDHs) were synthetized to achieve a better performance on phenacetin (PNT) degradation in catalytic ozonation. The mechanism of enhanced degradation efficiency and mineralization in catalytic ozonation system were explored with the help of different kinds of catalysts characterization, including X-ray diffraction, Fourier transform infrared, Brunauer–Emmett–Teller, scanning electron microscopy, and energy-dispersive X-ray. The results showed that Ni–Co LDHs@Al_2O_3 catalyst could not only greatly enhance the degradation of PNT, but also have better stability and reusability by ozonation. The COD removal with Ni–Co LDHs@Al_2O_3 catalyst could reach 65.3%, while 63.8% with Ni–Co layered double hydroxides (LDHs) catalyst, 61.8% with Fe–Co LDHs catalyst, 55.5% with Ni–Fe LDHs catalyst and only 48% with ozonation alone after 120 min. In addition, based on the intermediates detected by gas chromatography-mass spectrometry, a possible degradation pathway of PNT was proposed.

Keywords: Catalytic ozonation; Ni–Co LDHs@Al_2O_3; Phenacetin; Degradation pathways

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