

عنوان مقاله:

Removal of perchlorate from wastewater through adsorption and reductive degradation using Ni-Fe bimetallic nanoparticles supported on modified activated carbon: A simple strategy to degrade persistent pollutants

محل انتشار:

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خلاصه مقاله:

In the present study, nickel and iron (Ni/Fe) bimetallic nanoparticles (Ni-Fe NPs) were produced in the presence of activated carbon (AC) to prepare supported Ni/Fe bimetallic nanoparticles (Ni-Fe NPs/AC). The NPs were modified using cetylpyridinium chloride and used for the simultaneous adsorption and degradation of perchlorate. Synthesized Ni-Fe NPs/AC was characterized using FE-SEM, EDS, and XRD. The influential factors in the removal of perchlorate by Ni-Fe NPs/AC were optimized based on experimental design. According to the results, adsorption and degradation efficiencies were 96.98% and 78.81%, respectively, which could be achieved to the efficiency of nearly 100% by increasing the process time to 110 minutes. Reaction kinetics complied with the pseudo-first-order characteristics. Moreover, the rate constant of adsorption and degradation were estimated at 0.0848 and 0.0199 min⁻¹ at 303 K, and the activation energy for adsorption and degradation was 42.39 and 12.47 kJ/mol, respectively. The proposed method could effectively remove perchlorate from well water and industrial wastewater. Therefore, Ni-Fe NPs/AC could be an effective nanomaterial for the complete degradation of perchlorate. This novel method could also remove persistent organic and inorganic pollutants and promote the industrial application of bimetallic NPs in environmental remediation.

کلمات کلیدی:

Perchlorate, Adsorption, Reductive degradation, Activated carbon, Ni/Fe bimetallic nanoparticles

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