Hybrid Electrocatalytic Ozonation Treatment of Simulated High-Salinity Carbamazepine Wastewater with Ni_{0.2}–Ce_{0.2}/OMC Particle Electrodes

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High-salinity pharmaceutical wastewater contains refractory contaminants that can be effectively treated by hybrid electrocatalytic ozonation (3D/O₃). The salt in the wastewater provides a natural electrolyte, thus avoiding secondary pollution caused by the addition of electrolytes. In this work, we studied high-salinity pharmaceutical wastewater with carbamazepine as the main pollutant. Degradation experiments showed that the Ni_{0.2}-Ce_{0.2}/OMC/granular activated carbon (GAC) particle electrodes was effective, 3D/O₃ in combination with Ni_{0.2}-Ce_{0.2}/OMC/GAC removed carbamazepine effectively. The optimal conditions for the degradation of the simulated high-salinity wastewater containing 25 mg·L⁻¹ carbamazepine by the 3D/O₃ + Ni_{0.2}-Ce_{0.2}/OMC/GAC process were: 10 mA current, pH of 2, and a 5 g:150 mL ratio of particle electrode to solution. Under these conditions, the carbamazepine removal ratio was 99.7%, and the mineralization rate of the simulated wastewater was 75.7%. The removal of carbamazepine follows pseudo first-order reaction kinetics. The Ni_{0.2}-Ce_{0.2}/OMC/GAC particle electrodes exhibit good stability, and the main active species in the 3D/O₃ + Ni_{0.2}-Ce_{0.2}/OMC/GAC process is ·OH.

Keywords: Ni_{0.2}-Ce_{0.2}/OMC/GAC; hybrid electrocatalytic ozonation treatment; high-salinity pharmaceutical wastewater; carbamazepine; conditions optimization

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