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Catalytic Ozone pretreatment of complex textile effluent using Fe^{2+} and zero valent iron nanoparticles

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Highlights

- Maximum BI enhancement observed for nZVI catalyzed ozonation process
- FTIR & GC-MS analysis confirms the cleavage of recalcitrant organic compounds
- Enhanced biodegradation rate for pretreated effluent obtained during aerobic oxidation
- Toxicity removal observed for pretreated textile effluent

Abstract

The study investigates the effect of catalytic ozone pretreatment via Fe^{2+} and nZVI on biodegradability enhancement of complex textile effluent. The nZVI particles were synthesizes and characterized by XRD, TEM and SEM analyses. Results showed that nano catalytic ozone pretreatment led to higher biodegradability index (BOD5/COD = BI) enhancement up to 0.61 (134.6%) along with COD, color and toxicity removal up to 73.5%, 87%, and 92% respectively. The disappearance of the corresponding GC-MS & FTIR spectral peaks during catalyzed ozonation process indicated the cleavage of chromophore group and degradation of organic compounds present in the textile effluent. Subsequent aerobic biodegradation of nZVI pretreated textile effluent resulted in maximum COD and color reduction of 78% and 98.5% respectively, whereas the untreated effluent (BI= 0.26) indicated poor COD and color reduction of only 31% and 33% respectively. Bio-kinetic parameters also confirmed the increased rate of bio-oxidation at enhanced BIs. Seed