A Novel Mn-Ce Catalyst for the Treatment of Industrial Wastewater (BGN)

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Ridding of hazardous organic pollutants present a great challenge in waste streams and in the purification processing of surge water. Catalytic wet oxidation (CWO) with heterogeneous catalysts is the raising method for the treatment of dilute aqueous waste streams contaminated by a variety of organic pollutants. CWO can be used to mineralize organic contaminants into CO2 and H2O or to convert them into nontoxic and biodegradable products. In order to be economically and technically attractive, CWO has to be conducted at a relatively low temperature, low pressure, and short space-time to save energy and reactor volume, and with a high-recovery regeneration procedure to ensure cost effectiveness. Recently we developed a set of unique catalysts based on manganese-cerium oxides which have demonstrated the ability to completely mineralize several industrial compounds under mild operation conditions. We also developed an alternative catalytic-adsorption-regeneration process that can alternatively be used in place of the traditional activated carbon adsorption. The reactive adsorption capacity of this innovative Mn-Ce Catalyst has been found to be substantially higher than the reported absorption for conventional activated carbon treatments. Low-temperature oxidative regeneration of Mn-Ce-based catalysts showed full recovery of their activity and adsorption capacity in consecutive runs, and proved to be superior to activated carbon regeneration, which is usually conducted at higher temperatures and result in partial loss of the adsorption ability. These important advantages of enhanced adsorption characteristics combined with low temperature, and efficient catalyst regeneration, present an economical and efficient alternative for the treatment of various waste streams.

Benefits

Higher surface area and surface activity than other traditional catalysts
Potential for complete mineralization of organic wastes under mild operation conditions
Alternative application of a controlled reactive adsorption-regeneration process in place of the traditional activated carbon adsorption
Lower-temperature for oxidative regeneration.
Quick recovery to its initial activity capacity.

Development Stage and Development Status Summary

Superior results were obtained under bench-scale experiments with various compounds representing the chemical industry. Investment is needed for the verification of the process with its unique catalysts in pilot plant scale.

Patent Status

Patent pending

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