



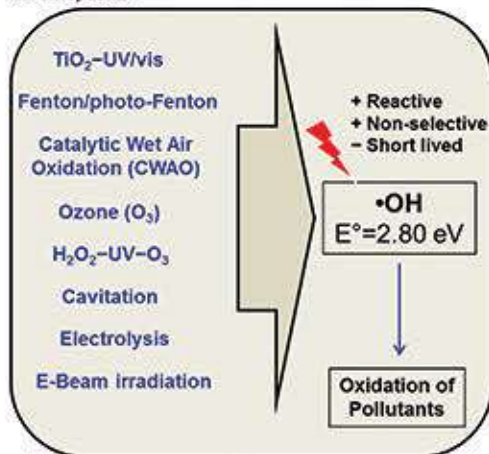
CHEMICAL TECHNOLOGIES FOR INDUSTRIAL WASTEWATER - ADVANCE OXIDATION PROCESS

Project Team

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Research

- Removal of organic (or inorganic) materials in water and wastewater by oxidation through non-selective attack by radical species.



Applications & Advantages

- Pre-treatment of Wastewater Stream**
 - Reduction of overall organic content (COD)
 - Increase of biodegradability of recalcitrant organics (BOD)
 - Destruction (mineralization) of specific pollutants
 - Sludge treatment and conditioning
- Post-treatment of Wastewater Stream**
 - Wastewater polishing
 - Reduction of color and odor
 - Disinfection
- Point of Application**
 - Domestic wastewater treatment plant
 - Industrial wastewater treatment plant
 - Sludge treatment
 - Groundwater remediation

Novelty

- Self-cleaning, anti-fouling membrane.
- Catalytic microreactors dispersed within the membrane pores, providing extended degradation of micropollutants that pass through the membrane.
- Hybrid membrane reactor system with a smaller footprint.

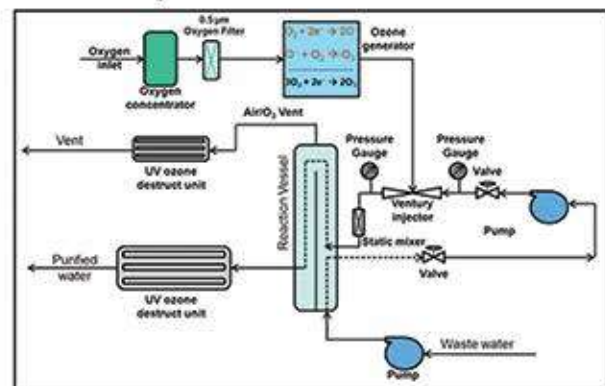
PUBLICATIONS

- High-permeability pluronic-based TiO₂ hybrid photocatalytic membrane with hierarchical porosity: Fabrication, characterizations and performances. *Chemical Engineering Journal* 228 (8), 1030-1039.
- Ag-AgBr/TiO₂/RGO nanocomposite for visible-light photocatalytic degradation of penicillin G. *Journal of Materials Chemistry A* 1 (15), 4718-4727.
- Ag-decorated TiO₂ photocatalytic membrane with hierarchical architecture: Photocatalytic and anti-bacterial activities. *Water Research* 59, 207-218.
- Novel low temperature synthesis route for functional Au/ZnFe mixed oxide nanohybrids. *ACS Applied Materials & Interfaces*, 6 (15): 12406-12412.
- Membrane photoreactors (MPRs) for photocatalysts separation and pollutants removal: Recent overview and new perspectives. *Separation Science and Technology* 51(1), 147-167.

Particulates Removal

Advantages

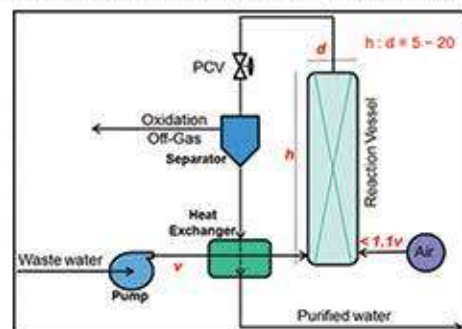
- Effective for a wide range of operating temperatures and pH values
- Excellent bactericidal and sporicidal action
- Fast and non-selective
- Produce small amount or no THM or other DBP (affected by pH, alkalinity, and nature of the organic materials)
- Does not produce dissolved and suspended solids
- Control color, taste, and odor
- Clean residual -> O₂



Catalytic Wet Air Oxidation(CWAO)

Advantages

- Oxidizes organic/inorganic matters by oxygen or air
- CWAO produces no NO_x, SO₂, and HCl
- With noble metal catalyst (Pt, Ce, Ru, etc.), CWAO is able to oxidize refractory acetic acid/ ammonia while operating at a lower temperature and pressure
- Pre-oxidation (to be followed by biological processes)
- Enhances biodegradability
- Effective for highly concentrated wastewater (COD ~ 100,000 mg/L)



IP LIST

- Composite photocatalyst for adsorptive-photocatalytic oxidation-reduction of organic substances. US Provisional Patent filed on 22 June 2009 (TD 61/219,066).
- Doped catalytic carbonaceous composite materials and uses thereof. PCT Patent filed on 22 June 2010 (Int. Pub. No. : WO 2010/151231 A1).