1. Introduction

Main Issue
Contaminated water from: Emerging Organic Contaminants

Treatment methodology
AOPs

What are AOPs?
Advanced oxidation processes (AOPs) are clean, tertiary micropollutant treatment processes: they mineralize EOCs to CO2 and H2O.

Goal
Clean Drinking water

Most popular:
Fenton based activation of oxidant

Why?
Do not generate toxic by-products

Advantages
Use of Light absorbing material with large surface area to increase particle capacity.

Motivation for water treatment in Qatar:
Cost Effective Process
Energy Saving
Environmentally Green Technology

Selected Approach
Photo-oxidation of EOCs on Highly structured TiO2 Nanotubes

Advantages

2. Experimental Setup and methodology

Mechanism

TNA Surface Morphology

X-ray diffraction XRD
Scanning electron microscopy (SEM)

3. Results

Figure 1. Time Profiles of MO oxidation in the presence of TiO2 photoelectrodes under various reaction conditions. [MO]= 60µmol/dm3 at t=0min for all experiments.

Figure 2. Photocatalytic Methyl orange degradation using TiO2 Photoelectrodes in the presence of H2O2, fits first order reaction model.

Figure 3. Concentration of MO dye after 5 hours for different reaction conditions.

Figure 4. Complete removal of MO was achieved after six hours of exposure in AM 1.5 G light (equivalent to 1 sun intensity), where hydrogen peroxide accounted for only 1/1000th of the amount of initial dye concentration.

4. Conclusion

The proposed degradation mechanism in the presence of TiO2 electrode, H2O2, and 1 sun intensity solar radiation showed complete oxidation of methyl orange (EOC representative in this system).

The proposed approach follows first order reaction kinetics with rate constant k = 0.0124 min⁻¹.

5. Significance

Prototype
The Proposed Photocatalytic TiO2/H2O2 System

Scale up
Easily Scalable Electrode

Industrial level wastewater treatment

References

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