Enhanced photocatalytic degradation of microplastics in drinking water with zinc oxide nanostructures

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Microplastics have recently become a major environmental issue due to the widespread use and durability of synthetic polymers. The plastic debris occurs in the environment worldwide, even in the drinking water in both tap water and bottled water. Existing approaches for handling waste plastic materials are thermal, catalytic, mechanical, chemical, ozonation and photo-oxidative degradation [1]; very few studies showed that photocatalysis could be viable for polymer degradation. In fact, photocatalysis is a light-mediated redox process, wherein nanostructured semiconductors (ex. ZnO) excited with appropriate light energy lead to the creation of exciton pairs, which react with surrounding water to produce highly reactive species like superoxides ($\bullet O_2^-$) and hydroxyl radicals (•OH) that can effectively oxidize organic species including polymers.

This thesis propose to study both in macro-scale with cm scale Si substrate covered by ZnO nanorods and in microfluidic system with integrated ZnO nanostructures obtained by *in situ* grown. Fourier-transform infrared (FTIR) or Raman spectroscopy will be used to characterize the residual microplastics in water. Both optical microscopy and SEM could be used to show the microplastic morphology evolution during photodegradation.

Curriculum Vitae

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Education Background

2017.9-2020.6	Xi'an Jiaotong University	Master of Mechanical Engineering	Research: Microfluidics
2013.9-2017.6	Wuhan University of Technology	Bachelor of Process Equipment and Control Engineering	Integrated Ranking:2/107

Research Experience

- **2015.02-2015.08 Design and Application of Pneumatic Handing Robot**

  Main responsibility: Construction of pneumatic control system; Design of PLC program.
- **2015.07-2016.01 Design and Application of Smart Restaurant Service Robot**
- Main responsibility: Design of tracking module; Construction of circuit module.
- **2015.04-2016.05 Design and Development of Carrier Car Based on Inertial Navigation System**

  Main responsibility: Team leader of project; Design and processing of project; Drawing of engineering drawings, Checking of mechanical structure strength.
- **2017.04-2019.03 Research on Continuous Algae Cells Separation in a Microfluidic chip via Surface Acoustic Wave**

  Main responsibility: Design and fabrication of microfluidic chip; Design of interdigital transducers; Design of miniaturized fluorescence activated cell sorting system.
- **2019.03-2019.08 Internship in The Fourth Military Medical University**

  Internship content: Purification and rapid diagnosis of Hantavirus based on acoustic wave-driven functionalized particle

  Main responsibility: Design and fabrication of microfluidic chip; Design of interdigital transducers; Conjugating target antibody on the particle; Labeling fluorescent antibody on the particle.

Publications

- Shaobo Jin, Xueyong Wei, Zhen Liu, et al. Focused surface acoustic waves induced microdroplets generation and its application for microgels. Sensors & Actuators: B. Chemical , 291 (2019) 1–8.
- Xueyong Wei, Shaobo Jin, Zhen Liu, et al.Research progress of microfluidic technology based on surface acoustic wave. Science and technology guide, 2018, 36(16): 8-19.

English Proficiency

CET-6: 491

Research Interest

Bio- & Optomicrofluidics, Biosensing.

Prize Winning

- 2017.09 Xi'an Jiaotong University Graduate Scholarship
- 2017.05 Outstanding Graduates of Wuhan University of Technology
- 2016.11 National Scholarship
- 2016.11 School three good student pacesetter
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Hobbies

Reading, Music, Basketball