



SOUTHEAST ASIA-EUROPE
JOINT FUNDING SCHEME FOR
RESEARCH AND INNOVATION

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King Mongkut's University of Technology
Thonburi

Thailand

Advanced Photocatalytic Degradation

Topic 1

Brokerage Event – 9th Call

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My and my institution's area of expertise

Name: Kittichai Chaiseeda, Ph.D.

Position: Lecturer

Unit: Department of Chemistry

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Expertise:

- Sustainable Catalysis
- Photocatalytic Processes
- Wastewater Treatment
- Biomass Valorization
- Heterogeneous Catalysis
- Green Chemistry
- Catalyst Design and Optimization
- Reactor Design
- Environmental Engineering
- Kinetic Modeling and Process Simulation
- Solar Energy Integration

My proposed Research Idea for the 9th JFS Call

Research Question:

How can the design and operational parameters of continuous photocatalytic reactors be optimized to enhance the degradation of emerging organic contaminants in wastewater using visible-light-driven catalysts?

Proposed Project Activity:

Year 1: Catalyst Selection and Characterization

Objective: Select and synthesize visible-light-active metal oxide photocatalysts.

Activity 1.1: Conduct a literature review to identify potential photocatalysts.

Activity 1.2: Synthesize selected catalysts using cost-effective methods.

Activity 1.3: Characterize the synthesized catalysts using techniques such as XRD, SEM, UV-Vis spectroscopy, and photoluminescence analysis.

Activity 1.4: Preliminary photocatalytic tests for the degradation of model pollutants under visible light.

My proposed Research Idea for the 9th JFS Call

Proposed Research Activity:

Year 2: Reactor Design and Performance Testing

Objective: Design and construct a continuous photocatalytic reactor.

Activity 2.1: Develop different reactor designs and evaluate light distribution and flow dynamics.

Activity 2.2 Integrate solar radiation with reactor design to test the efficiency of photocatalysis under real sunlight conditions.

Activity 2.3: Optimize the reactor's operating parameters (e.g., flow rate, catalyst loading, light intensity) using a model organic contaminant.

Activity 2.4: Test the efficiency of the continuous reactor for degrading emerging organic contaminants.

My proposed Research Idea for the 9th JFS Call

Proposed Research Activity:

Year 3: Scale-Up and Real Wastewater Testing

Objective: Apply optimized photocatalytic reactor design to real-world wastewater treatment.

Activity 3.1: Collaborate with industrial partners to collect real wastewater samples from factories.

Activity 3.2: Evaluate the reactor's performance in treating real wastewater, focusing on degradation rates, pollutant removal efficiency, and by-product formation.

Activity 3.3: Investigate the long-term stability of the photocatalyst and reactor performance over multiple cycles.

Activity 3.4: Analyze the feasibility and economic viability of scaling the reactor for large-scale industrial applications.

Project Consortium

My organisation: King Mongkut's University of Technology Thonburi

Role:

Fabrication, characterization, and testing of photocatalysts, as well as designing and constructing the continuous photocatalytic reactor. Conduct kinetic studies to optimize the degradation processes and focus on testing reactor performance with real wastewater samples, ensuring scalability and analyzing pollutant degradation efficiency.

Further existing partners (if any):

Partner 1: VNU Hanoi University of Science, Vietnam

Expertise: Surface science, catalysis, and organic synthesis, with applications in photocatalysis, medicinal chemistry, and environmental remediation

Role: Advanced material synthesis & characterization, publication & dissemination

Partner 2: National Institute for Research and Development of Isotopic and Molecular Technologies (INCDTIM), Romania

Expertise: Synthesis and characterization of advanced photocatalytic materials

Role: Developing and optimizing photocatalytic materials, conducting advanced characterization of catalysts, and supporting the scaling of the reactor system for industrial wastewater treatment applications

Project Consortium

Partners that we are seeking for our project consortium:

Region: Southeast Asia or Europe

Expertise: Photocatalyst Innovation

Role: Develop and optimize photocatalytic materials.

Region: Southeast Asia or Europe

Expertise: Photoreactor Engineering

Role: Design and optimize scalable reactor systems.

Project Consortium

Partners that we are seeking for our project consortium:

Region: Southeast Asia or Europe

Expertise: Wastewater Treatment

Role: Analyze wastewater and ensure effective treatment.

Region: Southeast Asia or Europe

Expertise: Industrial Scale-Up

Role: Lead the scale-up and commercialization of the technology.