



Housing and Building
National Research Center



Housing & Building National Research Center International Conference
Future Vision & Challenges for Urban Development
"Green Smart Sustainable Building between Present & Future"
Cairo, Egypt - 15th - 17th December 2024



Ministry of Housing, Utilities
and Urban Communities



Dr. Mohamed Gamal El-Din

**Professor, NSERC Industrial Res.
Chair, Canada Research Chair,
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Lecture Title: Solar-Driven Photocatalytic Degradation of Pollutants - Towards Sustainability & Circular Economy

Abstract :

The presence of micropollutants in municipal and industrial wastewater poses a significant environmental challenge, necessitating effective treatment methods. Photocatalysis has gained significant attention due to its potential as a sustainable and efficient method for environmental remediation. Photocatalysis, employing semiconductor materials such as zinc oxide (ZnO), offers a promising avenue for the removal of various pollutants, including organic compounds from municipal and industrial wastewater.

Heterogeneous photocatalysis stands out as an advanced oxidation process with considerable potential for treating both municipal and industrial wastewater. This method shows promise in generating active radicals necessary for breaking down specific organic compounds. Moreover, it relies on less expensive and safer chemicals and can harness solar light effectively, potentially reducing energy requirements. Nonetheless, scaling up this technology encounters practical challenges, including low energy conversion rates, reduced efficiency in field applications due to limited light penetration, and the need for effective immobilization of catalysts in water without significant loss. In heterogeneous photocatalytic wastewater treatment, semiconductor catalysts are activated by radiation of appropriate wavelengths, leading to the generation of electron/hole (e^-/h^+) pairs through photochemical processes. These e^-/h^+ pairs indirectly produce highly oxidizing radicals. This presentation aims to offer an overview of recent advancements and key findings in this field. Additionally, strategies for enhancing the photocatalytic performance, such as catalyst modification and co-catalyst deposition will be explored. Overall, this presentation underscores the potential of photocatalysis as a sustainable solution for treating complex industrial and municipal wastewater streams.



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Field of Experience:

Dr. Mohamed Gamal El-Din is a Professor in the Department of Civil and Environmental Engineering at the University of Alberta. His research focuses on innovative treatment approaches for municipal and industrial wastewater, including oil and gas. Since 2011, he has held an NSERC Senior Industrial Research Chair in Oil Sands Tailings Water Treatment and is also a Theme Lead for the Future Energy Systems (FES) theme on Resilient Reclaimed Land and Water Systems. In 2024, Dr. Gamal El-Din was awarded Killam Award for Excellence in Mentoring and the Albert E. Berry Medal by the CSCE for outstanding contributions to the field of environmental engineering in Canada. In 2017, Dr. Gamal El-Din was awarded Killam the Alberta Science and Technology Leadership (ASTech) Foundation Award for Innovation in Oil Sands Research. He is a Jinshan Distinguished Professor at Jiangsu University and was awarded the Research Chair in Environmental Engineering at Tongji University in China in 2020. In 2023, he was appointed the Canada Research Chair (Tier 1) in Sustainable and Resilient Wastewater Treatment for Reuse. Additionally, he was named the UofA Engineering Research (UAER) Chair in Community-Based Wastewater Management with a focus on advancing a circular economy. Dr. Gamal El-Din also serves as the Director of the Water Research Centre (WRC) at the University of Alberta since 2023. Dr. Gamal El-Din's commitment to education and research is unparalleled. Over the course of two decades, he has supervised a diverse group of 215 students and staff members. Under his mentorship, these individuals have grown into accomplished professionals who are making significant contributions to their respective fields. Dr. Gamal El-Din is also a prolific researcher, with an extensive body of work that includes 340 peer-reviewed journal papers and 420 conference and workshop presentations, among other publications. His contributions to the field have been widely recognized, as evidenced by his impressive h-index of 72, and 17,103 citations as per Google Scholar.