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Solar-Driven Photocatalytic Degradation of Pollutants

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Abstract:

In recent decades, growing population and industrial development have led to releasing huge amounts of highly toxic chemical pollutants into the environment globally. Several approaches including biological, chemical, physical as well as advanced oxidation processes (AOPs) have been employed to handle the contamination removal from wastewaters for environmental remediation. Among them, AOP based on oxide semiconductors and related compounds (as photocatalysts) is highly promising, especially for degradation of organic pollutants. This method is a "green" technology for complete elimination of contaminants under sunlight irradiation as well as ambient conditions.

Semiconductor-based photocatalysis is an efficient, energy-saving, and powerful method. Moreover, this technology is a low-cost, non-toxic and sustainable approach for environmental remediation. In this context, different types of semiconductor photocatalysts such as TiO_2, ZnO, and g-C_3N_4 have been prepared and used to remove organic pollutants from wastewater owing to their unique optical and physicochemical properties.

Design of an efficient photocatalyst with the desired band structure, superior charge carriers' separation, and functionality is of crucial to address the environmental issues and as an alternate means of energy production with the aid of solar light irradiation. For decades, researchers have paid a lot of attention to varied categories of semiconducting photocatalysts for the above-stated concerns. As a result, in this talk, a brief summary of other researchers' reports on solar-driven photocatalysts will be presented. Then, results obtained by my group about the synthesis and evaluation of the photocatalytic activity of some semiconductors will be discussed.

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Biography

Amene Naseri received her PhD of Nanotechnology from Institute for Nanoscience & Nanotechnology (INST) of Sharif University of Technology (SUT), Iran in 2018. After one year and a half postdoc work at Physics Department of SUT on photocatalytic elimination of organic pollutants from water, she joined ABRII in 2020 as an assistant professor of Nanotechnology Department.

Her current research interests focus on the synthesis and characterization of different nanostructures for clean energy and environmental applications.

About Research Topic

Photocatalytic reactions are mainly applied in both environmental remediation and energy production. These are including three basic processes, namely light harvesting, prohibition of electron-hole recombination, and high kinetic of surface reactions. To design an efficient photocatalyst, requirements like visible light activity, high electron conductivity for improved charge carriers separation, and high active surface area for reaction should be considered. To achieve these goals, high number of documents are published by researchers around the world, annually.

About Institution:

Agricultural Biotechnology Research Institute of Iran (ABRII) is located in Karaj, Iran. ABRII was established to solve the agricultural problems and to achieve food security and sustainable development in agriculture using biotechnology and nanotechnology. Our experts have attempted to work on customer-based and problem-based research projects. Consequently, focusing on research projects in demand, research privatization, profiting from knowledge-based companies and the private sector, reducing unnecessary expenses, renewing research equipment and training experts, are of the most fundamental issues of consideration.

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