Abstract Submission Format

Advanced photocatalysts for wastewater remediation: the fascinating world of bismuth oxyhalides supported on eco-friendly floating devices

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Abstract

Nowadays, the water crisis caused by insufficient water supply and pollution leads to several problems related to drought, famine, and death. In particular, about 1.1 billion people worldwide suffer from poor access to water and *ca.* 2.7 billion experience water scarcity for at least one month each year [1]. In this drastic scenario, treating wastewater contaminated by different pollutants is of pivotal environmental and commercial importance and urgently requires fast and efficient solutions. Among all the possible strategies exploitable in this field, in the last decades, heterogeneous photocatalysis has emerged as an interesting strategy, operating under mild conditions, and degrading many pollutants without adding chemical oxidants [2-4].
In this perspective, photocatalytic floating devices can be exploited with the final aim of overcoming issues related to the use of catalyst-based slurry systems and maximizing light utilization and photocatalyst aeration. [5] In addition, another unavoidable challenge is to be able to develop alternative and efficient photocatalytic systems for TiO_2.
Herein, we present a selection of interesting results recently collected in our laboratories in the frame of the development and optimization of photoactive materials obtained by immobilizing visible light responsive catalysts, i.e., bismuth oxyhalides, on floating supports characterized by environmentally friendly features (e.g., Lightweight Expanded Clay Aggregate, LECA, alginates' spheres).
Targeted studies on the photocatalytic activity towards different classes of pollutants (i.e., dyes, drugs, polyphenols) after exposure to solar or visible light irradiation will be described with a special focus on the effect of water matrix (ultrapure or simulated drinking water), catalyst dosage and recycling tests in the view of a real application.
All the fabricated samples were able to almost fully degrade the selected model pollutant under irradiation. The discussed results are very encouraging and open the view towards the future use of the innovative studied systems in real applications, satisfying the environmental protection and sustainable development goals.

[1] https://www.worldwildlife.org/threats/water-scarcity ;
[2] R. Djellabi, R. Giannantonio, E. Falletta, C. L. Bianchi, Curr. Opin. Chem. Eng., 1, 2021, 100696;
[3] G. Ren, H. Han, Y. Wang, S. Liu, J. Zhao, X. Meng, Z. Li, Recent Advances of Photocatalytic Application in Water Treatment: A Review, Nanomaterials, 11(7), 2021, 1804;
[4] M.G. Galloni, E. Ferrara, E. Falletta, C.L. Bianchi, Catalysts 12(8), 2022, 923;
[5] https://www.sunfloat.unimi.it/ .

Keywords
Bismuth oxyhalides, photocatalysts, floating devices, wastewater remediation, environmental remediation.

Biography

Full professor in Industrial Chemistry (SSD Chim/04) at Dipartimento di Chimica (Università degli Studi di Milano, Italy), Claudia L. Bianchi is the group leader of ISMER Group (Innovative Smart Materials for Environmental Remediation, https://sites.unimi.it/ClaudiaLBianchi/it/, https://www.sunfloat.unimi.it/teams_contacts.html). She graduated in Industrial Chemistry at the University of Milan, where she also achieved the Ph.D. in Material Science. Since 2002 she has been a Member of the European Society of Sonochemistry Board of Directors with Secretary function, and of the Editorial Board of Ultrasonics-Sonochemistry (Elsevier). LCA expert, she is the author of more than 250 original papers in International Journals with IF in the field of applied material science and environmental catalysis.