LAB ISMER

INNOVATIVE SMART MATERIALS FOR ENVIRONMENTAL REMEDIATION

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Summary

The research activities of the ISMER (Innovative Smart Materials for Environmental Remediation) group is focused on the development of innovative materials, their characterization and application in water and air decontamination by different approaches (photo-sono-degradation, sorption and their combinations).
Specifically, ISMER group is involved in advanced oxidation processes (AOPs) for wastewater treatment and purification of water from persistent organic and inorganic pollutants. Air purification is investigated as well, thanks to a dedicated research line involving innovative photocatalysts mainly used in the building sectors.
Recently, in addition to these activities we are working on the development of innovative technologies for the production of "green" energy (Hydrogen) by water splitting and for solar steam generators to water purification.
The group is also involved in LCA calculations to determine the environmental impacts of products and processes.

Keywords

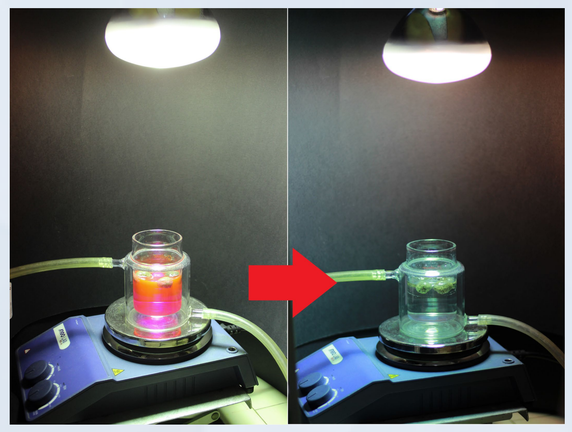
- Photocatalysis
- Environmental pollution
- Advanced materials
- Conductive polymers
- Green energy
- LCA

1.Development of innovative sorbents for air and water decontamination

The goal is the development of innovative sorbents capable of absorbing organic/inorganic water pollutants. Moreover the recycle and the regeneration of these materials is deeply studied.

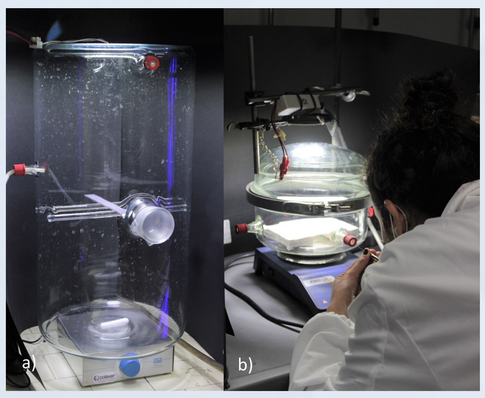
2.Synthesis of floating photocatalysts for water pollutants degradation

The goal is the development of floating photocatalytic devices for the degradation of organic pollutants. Moreover, the study focuses also on the investigation of solar-active and eco-friendly materials, that can be used for several cycles in real conditions.



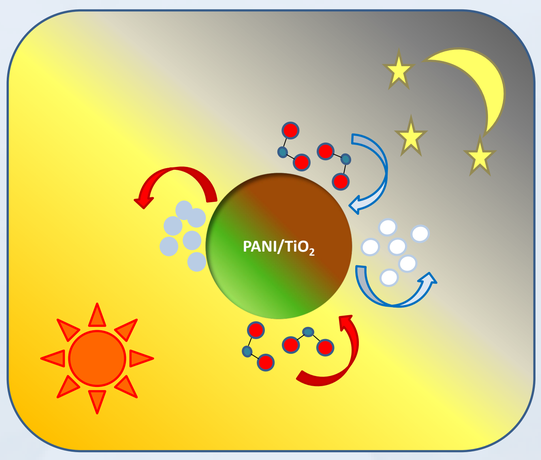
3.Synthesis of advanced photocatalysts (TiO_2-free) active in the visible region for environmental remediation

The goal is the development of new micrometric materials, alternative to titania, active in the visible-light region such as metal oxides, perovskites and carbon based compounds.



4. Smart materials for air pollutants abatement and odour control

The goal is to study an innovative method in order to couple photo-active catalysts with sorbents materials, that are employed for the abatement of gaseous and odourous substances.



5. Green hydrogen production from nitrogen-rich pollutants

The laboratory aims to develop a binary system based on innovative materials for (i) the photodegradation by irradiation with sunlight of nitrogen-rich pollutants inside wastewater to produce ammonia and (ii) subsequent conversion of ammonia into hydrogen by means of a electrochemical approach.

6.Water recovery from industrial emissions

The laboratory works on the development of innovative SAP-based materials capable not only of capturing the water vapor produced in industrial chimneys but also of oxidizing traces of any gaseous pollutants present (typically SOx, NOx and CO_2) and transforming them into nutrients for the agricultural sector (for example, sulfates, carbonates and nitrates).

Collaborations

- Prof. Carlo Pirola, Department of Chemistry, University of Milan
- Dr. Daniela Meroni, Department of Chemistry, University of Milan
- Prof.ssa Daria Boffito, Polytechnique Montréal (Canada)
- Prof. Christos Argirusis – National Technical University of Athens (NTUA) (Greece)

Selected References

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