Novel photocatalytic nanocomposites for water treatment

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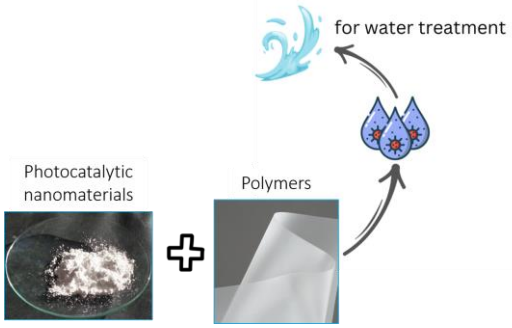
Increasing pollution and reduction of potable water supplies delineate today the need to develop advanced materials and methods to purify water for consumption [1].
The immobilization of inorganic nanomaterials on polymeric matrices has been drawing a lot of attention in the recent years due to the extraordinary properties characterizing the as-obtained nanocomposites. The hybrid materials, indeed, combine the properties of the polymers such as flexibility, low-cost, mechanical stability, high durability, ease of availability, with the properties of the inorganic counterpart. In particular, if the inorganic fillers are nanostructured photocatalysts, the materials will be able to utilize the energy delivered by light to catalyze chemical reactions for an efficient wastewater treatment. Additionally, since the anchoring of the nanomaterials to the polymers, the dispersion of the materials in the environment is prevented, thus overcoming one of the main limits that impedes the application of nanostructured photocatalysts on a large scale.



In this invited talk, I will present several typologies of photocatalytic nanocomposites, made of polymers (thermoplastic ones) and semiconductors (nanostructured TiO_2 and ZnO), eventually enriched with co-catalysts [2-6]. Several methods to realize hybrid inorganic-organic materials will be illustrated, and all of them are easily up-scalable from laboratory to process scale. The described materials were deeply characterized and their remarkable photocatalytic abilities were evaluated by the degradation of several water pollutants such as dyes, pesticides, drugs, and personal care products. The antibacterial performance was also evaluated for selected samples. The relevance of the obtained results will be discussed, opening the route for the application of these materials in photocatalysis, and especially for wastewater remediation.

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