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Dall'emergenza alla sostenibilità: il contributo della Chimica

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ATTI DEL CONGRESSO

DEGRADATION OF IODINATED CONTRAST MEDIA BY SOLAR PHOTO-FENTON AND PHOTOCATALYSIS WITH SUPPORTED TIO_2

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Although several treatment set-ups can be employed to effectively remove emerging organic pollutants from contaminated water and wastewater, the selection should also be cost-effective, allowing to comply the local discharge standards at the lowest cost. Advanced oxidation processes (AOPs) used for the complete mineralization of pollutants are generally expensive as the intermediates formed during the reaction tend to be more and more resistant to their complete oxidation (i.e., mineralization) [1]. Specifically, common drawback of AOPs is the high demand of electrical energy for devices such as ozonizers, UV lamps, ultrasounds, which results in rather high treatment costs [2]. Solar-based AOPs seem to be very promising due to its great advantage of working even with visible light, leading to a reduction of the operating costs [3]. Solar driven photo-Fenton appears as the preferable one from an integrated environmental and economic point of view based on the comparison between several AOPs for wastewater treatment considering their life-cycle greenhouse gas emissions and life-cycle cost [1]. In addition, solar-based photocatalysis is very attractive if the catalyst can be immobilized. In fact, many attempts have been made to immobilize catalysts onto substrates, such as glass beads, glass fibres, silica, stainless steel, textiles, honeycombs, activated carbon, and zeolites [4]. For these reasons, design and implementation of novel TiO_2-based catalysts deposited onto suitable substrates to obtain materials exploitable for environmental applications is a challenging task. In addition a critical drawback of catalyst immobilization lies in the dramatic reduction of the active surface area, which turns into the consequent decrease in catalytic efficiency.

In the present work, two solar-based AOPs, namely photo-Fenton and photocatalysis employing supported TiO_2 have been tested and compared for the removal of an emerging organic pollutant in aqueous solutions. As for the supported TiO_2, TiO_2 anatase films realized by metallorganic chemical vapor deposition (MOCVD) were prepared achieving highly efficient catalytic materials. The morphological and structural characteristics of the obtained coatings have been elucidated by X-ray diffraction and scanning electron microscopy. As for TiO_2 nanoparticles, they were synthesized in anatase phase by using a sol-gel route, namely a typical polymeric route was followed to produce TiO_2 nanoparticles from metal alkoxides, allowing the deposition of the nanostructured material, by dip-coating technique, onto a silica fiber.

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