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ABSTRACTS

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Towards the Development of Water Purification Technologies Using Carbon Materials and Metal Oxides

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The abatement of environmental pollutants, and especially the availability of clean water in sufficient amounts, are important issues in large and industrialized cities as well as in less developed regions. Advanced oxidation processes (AOPs) can decisively contribute to water purification. As a consequence, the development of effective catalysts has prompted enormous attention in materials science. Carbon materials have been widely employed in AOPs, usually as catalyst supports and less commonly as catalysts on their own. An overview of the different steps involved in the development of suitable catalysts from the nano- to the macro-scale will be presented in this work, with particular emphasis on the use of carbon materials for wet air oxidation, wet peroxide oxidation, ozonation, and photocatalysis. Our studies show that carbon materials with no added metals can be used as efficient catalysts in these processes, including activated carbons, carbon xerogels, multi-walled carbon nanotubes, as well as carbon foams and fibres [1-4]. The work under progress aims at the development of more efficient and stable carbon materials with tuned surface chemistry. In the particular case of photocatalysis, titanium dioxide (TiO_2) is the most frequently used catalyst; however, aiming at solar applications, there is a drive to improve its activity under near-UV/Vis irradiation. Our recent work in this field is focused on the development of active and stable carbon-TiO_2 nanostructured composites, including diverse carbon materials, such as fullerenes, carbon nanotubes, nanodiamonds, graphene and its derivatives [5].

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