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Porous TiO2 microspheres synthesized by internal gelation method

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Titanium dioxide (TiO2) combines an interesting set of characteristics and properties that allow its application in a wide range of areas, including pigments, biomaterials, catalysis, sensors, drugs, ion exchange, etc. TiO2 is the most promising for photocatalysis among the semiconductors due to its high photocatalitic performance, its elevated thermal and chemical stability, and low cost. Recently, it has been intensively studied as a photocatalyst in advanced oxidative processes (AOPs) for the treatment of industrial effluents containing organic pollutants. The objective of this work was to obtain porous TiO2 microspheres from TiCl4 by the internal gelation method, in order to explore this geometry in the optimization of photocatalyst reactors, such as column reactors or fluidized bed reactors (for gaseous effluents), as well as ease of separation. The obtained microspheres were calcined in different conditions, between 550 and 900 °C for one hour, and characterized with respect to their size and sphericity (SEM), crystalline phases present (XRD), specific surface area and porosity (BET/BJH). The effect of the variables of the internal gelation process and of the heat treatment on the characteristics of the microspheres obtained was evaluated. A specific surface area of the sample calcined at 550 °C was of 98.7 m2/g, while the area for the sample calcined at 900 ° C was of 3 m2/g. The calcined microspheres above 800 °C presented two cystaline phases, anatase and rutile, whereas those calcined at lower temperatures presented only the anatase phase. These microspheres showed photocatalytic capacity (degradation of methylene blue) comparable to the Aeroxide TiO2-P25 produced by Evonik.