PHOTOCATALYTIC DEGRADATION OF SOME NITRO SUBSTITUTED PHENOLS BY TiO_2 /UV AND SOLAR PILOT PLANT

L. Lachheb

chemistry, gabes Tunisia

lachheb2001@yahoo.fr

Phenol (PH) and three poly-nitrophenols (4-nitrophenol (PNP), 2,4-dinitrophenol (DNP), 2,4,6-trinitrophenol (TNP)) were photocatalytically degraded by using titania under either artificial or solar light. These four reactions were chosen as test-reactions to compare the efficiencies of two suspended commercial titania photocatalysts (Degussa P-25 and Millennium PC 500). It appears that P-25 has a higher initial efficiency in all nitrophenol disappearance reactions. However, for the overall degradation rate, measured by the Chemical Oxygen Demand (COD) disappearance, the performance of PC-500 was similar to that of P25. This was attributed to a favorable textural effect since PC-500 has a much higher surface area which facilitates the re-adsorption of intermediates. PC-500 was subsequently supported on a special photo-inert paper provided by Ahlstrom Company. The influence of the silica binder used for sticking titania particles on the paper fibers was put in evidence as an inhibitor of the coulombic adsorption of anionic species, especially 2,4,6-trinitrophenol, because of the low pzc of silica. Once validated, this supported photocatalyst was introduced in an autonomous solar pilot photoreactor identical to the several prototypes built in the European AQUACAT program. It was demonstrated that the purification of water could be efficiently obtained in a larger scale without any final tedious filtration.