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Detachable photocatalysts of anatase TiO₂ nanoparticles: Annulling surface charge for immediate photocatalyst separation

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TiO₂ photocatalysis is commonly utilised in diverse applications such as environmental waste management, biomedical and energy fields. The present study demonstrates the effect of temperature on the characteristics of TiO₂ nanoparticles using XRD, XPS, DLS, UV-Vis, N₂ sorption and TEM techniques. The optimum surface area of the photocatalyst was obtained when it was prepared at 60 °C. Additionally, the TEM images showed semi-spherical morphology. Afterwards, rapid photodegradation of Rhodamine 6G dye (R6G) with efficiency of 92.5% at pH= 9.17 was accomplished using the optimised nanoparticles. The main focus of this study is to establish a new avenue that can be used to separate the photocatalyst from the reaction medium after the photodegradation experiment is completed. In this study, the photocatalyst was completely detached from the reaction medium in 3 minutes without utilisation of coagulant agents or magnetic nanoparticles. This was lucratively accomplished by adjusting the pH of the medium to match the isoelectric point (pHPZC) of the photocatalyst and annulling its surface charge, hence rapid sedimentation was observed, Figure 1. This new method has proven to be simple, rapid, and applicable to all types of photocatalysts on the industrial scale.

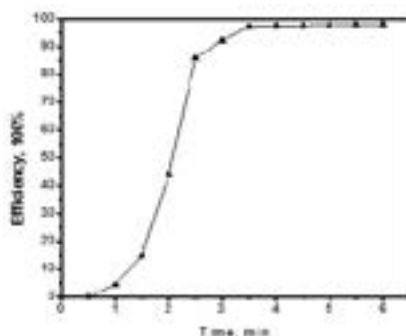


Figure: The efficiency of TiO₂ sedimentation at pHPZC

Biography

Entesar Al-Hetlani has obtained her PhD. in analytical chemistry from the University of Hull, UK in 2013. Currently, she is an assistant professor at Kuwait University. Her research interest focuses on nanomaterial synthesis and characterization for analytical applications such as areas of environmental and forensic analysis. In this work, the synthesis, characterization, application and isolation of photonanocatalyst namely, TiO₂ was achieved using a very simple and effective method. This method can subsequently be used to isolate any type of photonanocatalyst from a suspension regardless of the nature of the photonanocatalyst.

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