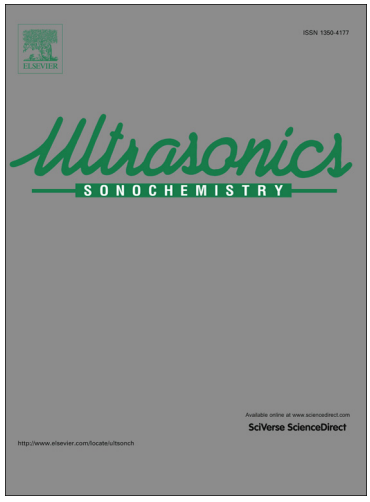

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PII: S1350-4177(17)30289-4
DOI: http://dx.doi.org/10.1016/j.ultsonch.2017.06.026
Reference: ULTSON 3749

To appear in: *Ultrasonics Sonochemistry*

Received Date: 29 March 2017
Revised Date: 2 June 2017
Accepted Date: 26 June 2017

Please cite this article as: M.T. Noman, J. Wiener, J. Saskova, M. Azeem Ashraf, M. Vikova, H. Jamshaid, P. Kejzlar, In-situ development of highly photocatalytic multifunctional nanocomposites by ultrasonic acoustic method, *Ultrasonics Sonochemistry* (2017), doi: http://dx.doi.org/10.1016/j.ultsonch.2017.06.026

In-situ development of highly photocatalytic multifunctional nanocomposites by ultrasonic acoustic method

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Abstract:

Cotton-titania nanocomposites with multifunctional properties were synthesized through ultrasonic acoustic method (UAM). Ultrasonic irradiations were used as a potential tool to develop cotton-titania (CT) nanocomposites at low temperature in the presence of titanium tetrachloride and isopropanol. The synthesized samples were characterized by XRD, SEM, EDX and ICP-OES methods. Functional properties i.e. Ultraviolet protection factor (UPF), self-cleaning, washing durability, antimicrobial and tensile strength of the CT nanocomposites were evaluated by different methods. Central composite design and response surface methodology were employed to evaluate the effects of selected variables on responses. The results confirm the simultaneous formation and incorporation of anatase TiO_2 with average crystallite size of 4 nm on cotton fabric with excellent photocatalytic properties. The sustained self-cleaning efficiency of CT nanocomposites even after 30 home launderings indicates their excellent washing durability. Significant effects were obtained during statistical analysis for selected variables on the formation and incorporation of TiO_2 nanoparticles (NPs) on cotton and photocatalytic properties of the CT nanocomposites.

Keywords: Ultrasonic acoustic method (UAM), TiO_2, nanocomposites, self-cleaning, UPF