

Efficiency of Visible Light Induced Photocatalytic Oxidation of Toluene and Benzene by a Photocatalytic Textile

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Abstract : This study investigated the efficiency of photocatalytic textile to remove the Volatile Organic Compounds (VOCs) present in indoor air. Functionalization of the fabric was achieved by adding a photocatalyst material active in the visible spectrum of light. This is a modified titanium dioxide photocatalyst doped with non-metal ions synthesized via sol-gel process, which should allow the degradation of the pollutants – ideally into H₂O and CO₂ – using photocatalysis based on visible light and no additional external energy source. The visible light photocatalytic activity of textile sample was evaluated for toluene and benzene gaseous removal, under the visible irradiation, in a test chamber with the total volume of 1m³. The suggested approach involves experimental investigations of the global behavior of the photocatalytic textile. The experimental apparatus permits simultaneous measurements of the degradation of pollutants and presence of eventually formed by-products. It also allows imposing and measuring concentration variations with respect to selected time scales in the test chamber. The observed results showed that the amount of TiO₂ incorporation improved the photocatalytic efficiency of functionalized textile significantly under visible light. The results obtained with such textile are very promising.

Keywords : benzene, C₆H₆, efficiency, photocatalytic degradation, textile fabrics, titanium dioxide, TiO₂, toluene, C₇H₈, visible light

Conference Title : ICEMSTA 2018 : International Conference on Engineering Materials Science, Technologies and Applications

Conference Location : Dubai, United Arab Emirates

Conference Dates : November 19-20, 2018