Combination of ultrasound-treated 2D g-C_3N_4 with Ag/black TiO_2 nanostructure for improved photocatalysis

Wan-Kuen Jo, Hee-Jin Yoo

PII: S1350-4177(17)30586-2
DOI: https://doi.org/10.1016/j.ultsonch.2017.12.019
Reference: ULTSON 4003

To appear in: *Ultrasonics Sonochemistry*

Received Date: 30 October 2017
Revised Date: 10 December 2017
Accepted Date: 11 December 2017

Please cite this article as: W-K. Jo, H-J. Yoo, Combination of ultrasound-treated 2D g-C_3N_4 with Ag/black TiO_2 nanostructure for improved photocatalysis, *Ultrasonics Sonochemistry* (2017), doi: https://doi.org/10.1016/j.ultsonch.2017.12.019

Combination of ultrasound-treated 2D g-C_3N_4 with Ag/black TiO_2 nanostructure for improved photocatalysis

Wan-Kuen Jo* and Hee-Jin Yoo

Department of Environmental Engineering, Kyungpook National University

Daegu, 702-701, Korea

*Corresponding author: Tel., +82 53 950 6584; fax, +82 53 950 6579; E-mail address, wkjo@knu.ac.kr.

Herein, nanosheets of g-C_3N_4 (CN), prepared using a green ultrasonication process under various conditions, were combined with Ag/black TiO_2 nanocomposites (AgBT) to create two-dimensional (2D) CN/Ag/black TiO_2 tri-composites (CNAgBT). The thickness of the CN sheets varied with the ultrasonication conditions. The CNAgBT sample prepared using ultrasound-treated CN exhibited the highest average photocatalytic efficiencies for the degradation of two model pollutants, followed in decreasing order by AgBT, black TiO_2 (BT), sheet CN, bulk CN, and TiO_2. The order of pollutant degradation efficiencies by the photocatalysts was consistent with that of the charge carrier separation efficiencies. The degradation efficiency of the CNAgBT increased as the CN-to-AgBT ratio increased from 0.05 to 0.1, but decreased gradually for higher ratios between 0.15 and 0.20, indicating a lower optimal CN-to-AgBT ratio. A plausible photocatalytic degradation mechanism for the CNAgBT nanocomposites was proposed. Additionally, CNAgBT with a CN-to-AgBT ratio of 0.1 displayed a higher hydrogen generation rate with a maximum value of 21.5 mmol g^{-1} over 5 h than