

Accepted Manuscript

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PII: S1385-8947(18)30121-9
DOI: <https://doi.org/10.1016/j.cej.2018.01.105>
Reference: CEJ 18425

To appear in: *Chemical Engineering Journal*

Received Date: 5 November 2017
Revised Date: 2 January 2018
Accepted Date: 19 January 2018

Please cite this article as: A. Kumar, A. Kumar, G. Sharma, A. H.Al-Muhtaseb, Mu. Naushad, A.A. Ghfar, C. Guo, F.J. Stadler, Biochar-templated g-C₃N₄/Bi₂O₂CO₃/CoFe₂O₄ nano-assembly for visible and solar assisted photo-degradation of paraquat, nitrophenol reduction and CO₂conversion, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.01.105>

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Biochar-templated g-C₃N₄/Bi₂O₂CO₃/CoFe₂O₄ nano-assembly for visible and solar assisted photo-degradation of paraquat, nitrophenol reduction and CO₂ conversion

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Abstract

The development of novel visible powered nano-heterojunctions with multi-pronged capabilities for environmental and catalytic applications has been gaining importance for persistent pollutant degradation & clean energy production. A magnetically recoverable biochar supported ternary g-C₃N₄/Bi₂O₂CO₃/CoFe₂O₄ heterojunction (BCBF) was fabricated which shows a high visible photoactivity. The heterojunction was used for degradation of pesticide paraquat under visible radiation (Xe lamp), natural sunlight, photo-ozonation, peroxymonosulphate, and coupled conditions. A high degradation of 99.3% was achieved under visible radiation in 90 min and 92.1% under solar light in 120 min. Biochar supported ternary junction performs manifold faster than Bi₂O₂CO₃/CoFe₂O₄, g-C₃N₄/CoFe₂O₄, g-C₃N₄/CoFe₂O₄, Bi₂O₂CO₃ (BOC), CoFe₂O₄ (CF) and g-C₃N₄ (CN). The effect of operational parameters as effect of pH, H₂O₂, anions, ozone and peroxymonosulphate (PMS) was also studied. In BCBF + PMS + O₃ + Vis protocol a spectacular complete degradation was observed in less than 30min. Ternary band structure efficiently

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