

Heteroatom nitrogen- and boron-doping as a facile strategy to improve photocatalytic activity of standalone reduced graphene oxide in hydrogen evolution

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Owing to its superior properties and versatility, graphene has been proliferating the energy research scene in the past decade. Recently the chemical doping of graphene with heteroatoms (N, B, S, etc.) has been a rising strategy to tailor and bolster the properties of graphene. [1] In detail, heteroatom doping of graphene can simultaneously introduce a bandgap and endow graphene with catalytically active sites, sanctioning its role as an intrinsic photocatalyst on its own. In this contribution, nitrogen (N-) and boron (B-) doped reduced graphene oxide (rGO) variants were investigated as a sole photocatalyst for the green production of H₂ and their properties with respect to photocatalysis were elucidated for the first time. N-, B- rGOs were facilely prepared via the pyrolysis of graphene oxide with urea and boron anhydride as their respective dopant source. The pyrolysis temperature was varied

(600°C-800°C for N-rGO and 800°C-1000°C for B-rGO) in order to modify dopant loading percentage (%) which was found to be influential to photocatalytic activity. N-rGO600 (8.26 N at%) and B-rGO1000 (3.59 B at%), which holds the highest at% from each of their party, exhibited the highest H₂ activity. Additionally, the effects of the nature of N and B bonding configuration in the graphene skeleton, which changes with respect to temperature, on H₂ photoactivity were also examined. This study demonstrates the importance of dopant atoms in graphene, rendering doping as an effective strategy to bolster photocatalytic activity for standalone graphene derivative photocatalysts. .

References

- [1] Wang, X., et al., *Chemical Society Reviews*, 43 (2014) 7067-7098

Figures

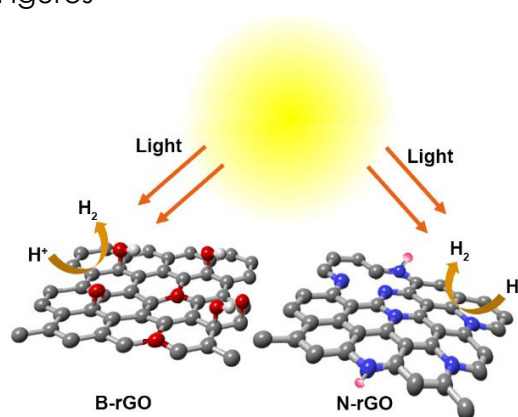


Figure 1: Nitrogen and boron doped reduced graphene oxide as functional standalone photocatalyst for reduction of water to hydrogen