Metal organic framework (MOF) derived encapsulated N-doped graphene hybrid as efficient multifunctional catalyst

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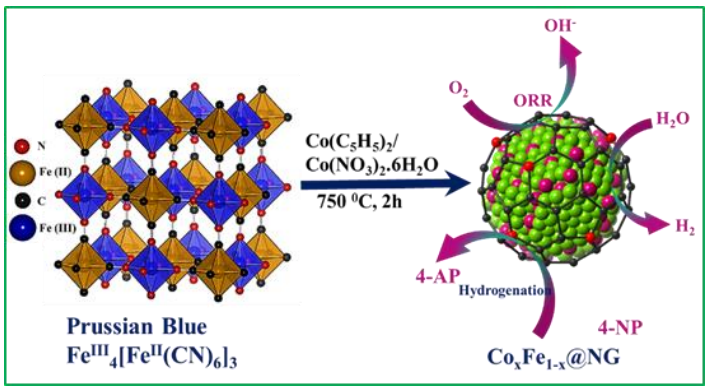
Pt is know to be the state-of-the-art catalyst for oxygen reduction reaction (ORR) as well as for hydrogen evolution reaction (HER) which can also be used for the hydrogenation of 4-nitrophenol (4-NP) to 4-aminophenol (4-AP). Quest is on to find a suitable catalyst that can replace Pt to circumvent the problem associated with it. Here, we demonsrated a facile and green strategy to fabricate a novel non-precious nanoalloy encapsulated in N-doped graphene layers (Co_xFe_{1-x}/N-G) by pyrolysis of metal organic framwork (MOF) and their catalytic activity towards ORR, HER and hydrogenation of 4-NP (Scheme 1). Intensive studies have been carried out to elucidate the role of alloying and N-doping. Interestingly, the activity is found to be dependent on the amount of Co in CoFe core and N doping in graphene layers for all catalytic activity. Similar onset potential with better current density as compared to the benchmark precious Pt/C catalyst in alkaline medium, have been achieved towards ORR activity. They also show efficient and highly stable HER activity and very efficient and magentcially seperable catalyst towards hydrogenation of 4-NP to 4-AP. Overall,the non-precious nanostructurescan be exploited as multi-functional catalysts in fuel cells, hydrogen storage systems and waste water-treatment instead of the expensive Pt catalysts.



Schematic illustration for the synthesis of MOF derived nanoalloy encapsulated in N-dope graphene layers.

References

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