An Improved Wet Chemical Approach For The Separation Of Graphene From Nickel Foil To The Reutilization Of Catalyst

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Abstract

Chemical Vapor Deposition (CVD) is the most widely studied approach for the synthesis of wafer scale graphene. To fully utilize the magnificent properties of the graphene, the separation of graphene from the metal catalyst is important. To date, majority of the studies utilizing the wet chemical etching method that scarifying the metal catalyst in order to obtain free standing graphene. In order to realize the re-use of catalyst for minimization of the waste, an improved simple wet chemical etching method approach is proposed. Nickel has relatively high carbon solubility under elevated temperature as compared with other catalyst. Part of the carbon dissolved in the bulk nickel was not been used for the formation of graphene and later reacted with nickel to form nickel carbide crystal. After CVD, the nickel foil with graphene was floated onto iron nitrate solution with concentration of 1 mol/dm^3, an etching agent. The etching agent would intercalate between graphene and nickel to etch the surface of nickel for separation under slower rate. The inertness of nickel carbide would act as the protective layer to slowdown the chemical attack onto the bulk nickel foil and preserve it. The remaining nickel foil after the separation was used for same CVD and separation process to obtain another layer of graphene. A nickel foil with a thickness of 125µm can be reused to synthesis up to 6 pieces of graphene without large deviation in properties.