Diffusion-Assisted Synthesis of Graphene

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Abstract

Diffusion-assisted synthesis (DAS) is a gentle, transfer-free and potentially inexpensive method for forming graphene and carbonaceous thin films at low temperatures (< 200 °C). One of the main advantages of DAS is that it is independent of the substrates morphology and chemical composition. DAS can therefore be used to form graphene on even complex and insulating surfaces.

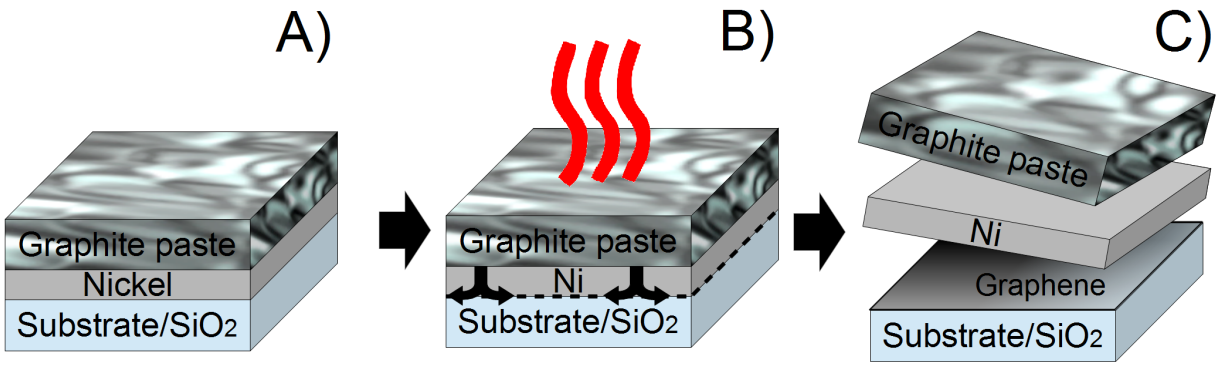
DAS was first described in 2012 by Kwak et al. [1]. The principle of DAS is to deposit a few hundred nm thick porous metal film on a substrate. A carbonaceous paste is then placed on top of the porous metal film and the sample is heated. Finally the carbon pasta and the metal film is dissolved leaving a layer of graphene or multilayer graphene on the substrate (Figure 1).

Newtec has under ambient conditions obtained experimental evidence for the formation of graphene by DAS at room temperature. The use of photolithography to control the structuring of the initial metal film in order to pattern the final graphene layer for direct printing of electrical circuits is also at present been investigated by Newtec.

References

[1] Jinsung Kwak, Jae Hwan Chu, Jae-Kyung Choi, Soon-Dong Park, Heungseok Go, Sung Youb Kim, Kibog Park, Sung-Dae Kim, Young-Woon Kim, Euijoon Yoon, Suneel Kodambaka & Soon-Yong Kwon, Near room-temperature synthesis of transfer-free graphene films. *Nature Communications* 3, Article number 645, Published 24 January 2012.

Figures



A diagram of the basic procedure in DAS. A) A nickel thin film is deposited on the substrate and a carbonaceous paste is afterwards applied on top. B) The sample is heated for a short period to enhance diffusion. C) The paste and Ni film is removed by etching ($FeCl_3$) leaving the substrate with the graphene film on top.