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Synthesis of Few Layers Graphene Domains on Copper Substrates by Surface Wave Assisted Microwave Plasma CVD

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In this work, we employed surface wave assisted micro wave plasma (MW SWP) CVD to grow few layers graphene domains on commercial copper substrate at comparatively low temperatures (350 ~ 550°C). By optimizing the H_2 /carbon precursor ($C_{10}H_{16}O$) composition and supplying appropriate dissociation energy (MW power); we succeeded to grow few layers isolated graphene domains on pre-annealed Cu substrates. Few layers graphene growth mechanism is presented in Figure 1. The secondary nucleation of graphene may occur inside or around the nucleation center of already grown graphene domains which result to the growth of few layers domains. Figure 2 shows as grown few layers graphene domains on Cu substrate. Large domains contain many secondary nucleation centers whereas inside small domains, few or no observable secondary graphene domains are present. This phenomenon may be explained as the insufficient time to evolve secondary nucleation points in the small domains.

Here, suppression of nucleation points and time dependent growth of few layers large graphene domains at low temperature will be presented.

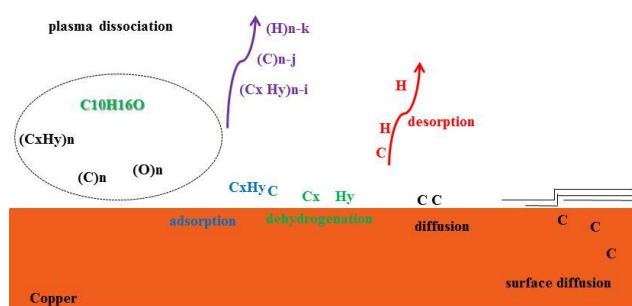


Fig. 1 Few layers graphene growth mechanism on Cu

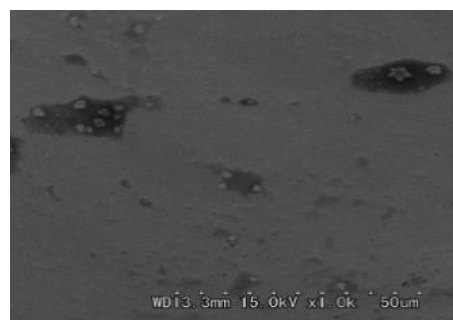


Fig. 2 SEM image of as grown graphene on Cu at 540°C