Laser-assisted Graphene Growth on Silicon using Microwave Plasma CVD

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Plasma, undoubtedly plays an important role in graphene formation on insulating substrates[1], but its turbulent ions in hot plasma region might impair the surface beneath graphene before its nucleation and growth. Silicon substrate was kept in a cold plasma region (with a comparatively less ion density). Cold plasma generally lacks required activation energy for graphene nucleation and growth; therefore, no graphene formation occurs. However, using blue laser beam illumination on silicon substrate during growth in a cold plasma region helps not only in graphene formation but also in controlling graphene thickness and mobility. The graphene formed is few mono (2-5) layered as confirmed by atomic force microscopy measurement. Figure 1A) shows that the graphene growth and thickness vary up on laser exposure time. Furthermore, increasing laser power proportionally increases the graphene mobility. This study can be helpful in growing graphene with desired thickness on any substrate.

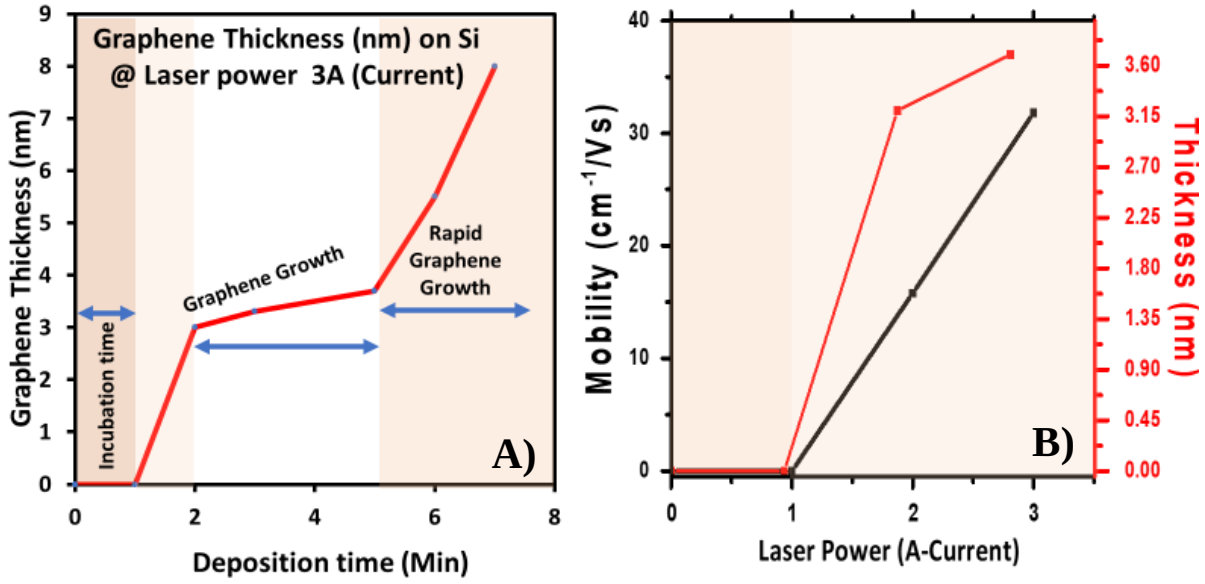

Figure 1 A) Effect of laser exposure time on graphene thickness, B) Graph of graphene mobility versus laser power

References: 1) R. Vishwakarma, M Umeno *et.al.* ACS Omega 2019, 4, 6, 11263-11270