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Swift Synthesis of CVD-graphene Utilizing Conduction Heat Transfer

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The conventional thermal chemical vapor deposition (CVD) setup for the graphene synthesis has mainly used convective heat transfer in order to heat a catalyst (e.g. Cu) up to 1,000°C. Although the conventional CVD has been so far widely accepted as the most appropriate candidate enabling mass-production of high-quality graphene, this method has stillremained under the standard for the commercialization largely due to the poor productivity arisen out of the required long processing time. Here, we introduced a fast and efficient synthetic route toward CVD-graphene. Unlike the conventional CVD using convection heat transfer, we adopted a CVD setup utilizing conduction heat transfer between Cu catalyst and rapid heating source. The high thermal conductive nature of Cu and the employed rapid heating source led to the remarkable reduction in processing timeas compared to the conventional convection based CVD (Fig. 1A), moreover, the synthesized graphene was turned out to have comparable quality to that synthesized by the conventional CVD (Fig. 1B). For the optimization of the conduction based CVD process, the parametric studies were thoroughly performed using through Raman spectroscopy and electrical sheet resistance measurement. Our approach is thought to be worth considerable in order to enhance productivity of the CVD graphene in the industry.

Keywords: CVD-graphene, Growth, Heating Source, Conduction, Convection

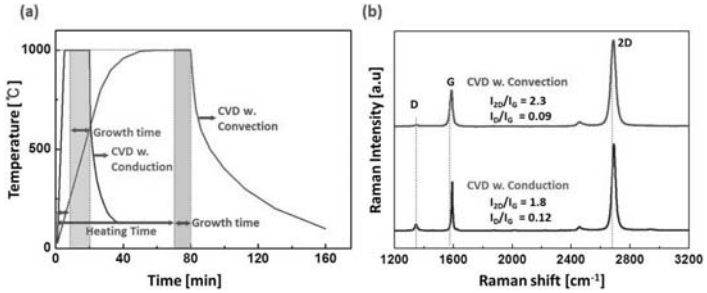

Fig. 1. (a) Comparison of temperature profiles related with CVD with conduction and CVD with convention. (b) Representative Raman spectra of the transferred graphene film onto SiO2/Si substrate.