Material

Very Low-temperature Growth of Graphene

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1. Background

- **Graphene** has great potentials for several next-generation devices, such as the electrode pattern on heavy-duty/industrial use printed circuit boards and the transparent elements.
- The prominent **fabrication methods of a large area/low cost graphene,** especially ***under low-temperature environment***, have been long-awaited.

flexible display

2. Newly Invented "Very Low-temperature Fabrication Method"

- The very low-temperature fabrication method is newly invented.
- The technique can sufficiently reduce the synthesis temperature and combine graphene synthesis with conventional ***Si-based processing***.
- This "two-stage graphene growth technique" should prove useful for a wide variety of graphene-based electrical device applications.

(a)

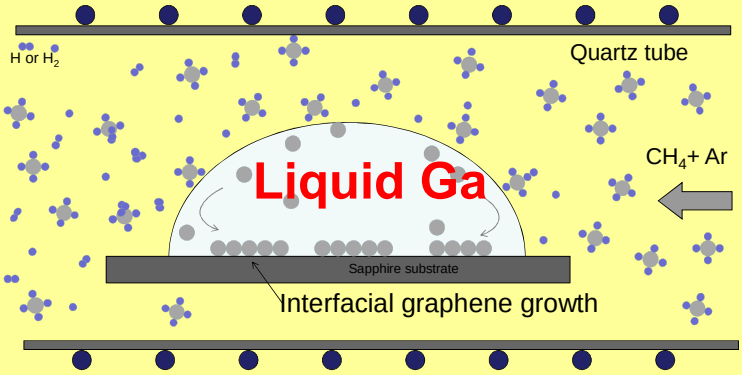

Fig. (a) interfacial CVD growth using molten gallium

∗ The source gas of methane is effectively decomposed on molten gallium at **300℃** , which can be easily confirmed by the dark-colored gallium surface after CVD. Although carbon is insoluble in gallium, the concentration of carbon on the gallium surface was large and thus the molten gallium can transport the carbon to feed edge growth around the nuclei.

(b)

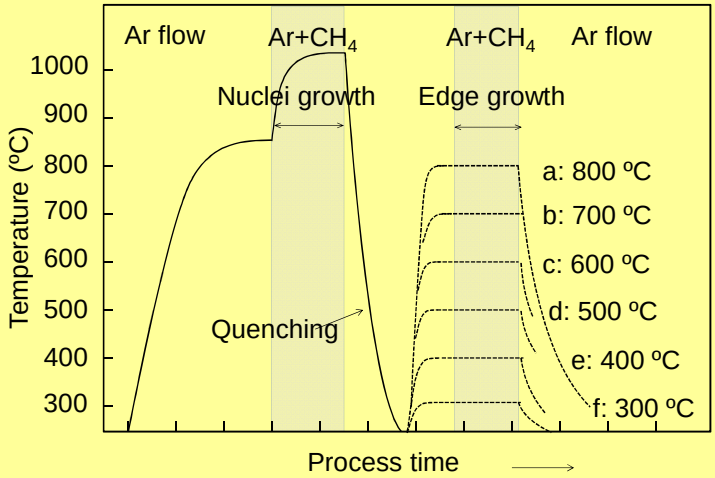

Fig. (b) temperature controlling for the two stages of graphene growth

∗ A large area of graphene was grown at **300℃** at the interface of a molten gallium catalyst on a sapphire substrate under diluted methane gas ambient of partial pressure of 1/10000atm (≈10 Pa). Although the nucleation of graphene requires much higher temperatures of >1000℃, the graphene growth around the nuclei continued even when the temperature was reduced to **300℃**.

Patent Licensing Available

Patent Pending

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