Mechanism of local fluorine assisted graphene growth on insulated substrate

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High-quality graphene film grown on insulating substrates by direct chemical vapor deposition (CVD) method paves the way for the application of high-performance graphene-based devices in large scale. However, due to the non-catalytic feature of insulating substrates, the production of graphene film on them is always in low growth rate and time-consuming (typically hours to days), which constricts the real potential applications.

[1,2,3] We applied first-principle calculation, demonstrates that the released fluorine from the fluoride substrate at high temperature can rapidly react with CH₄ to form a more active carbon feedstock, CH₃F, and the presence of CH₃F molecules in the gas phase much lowers the barrier of carbon attachment, providing sufficient carbon feedstock for graphene CVD growth on catalytically inert substrate.

References


Figure 1: Catalyst-free growth of graphene on glass assisted by a local fluorine supply

Figure 2: Mechanism for the local fluorine-assisted growth of graphene.