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Influence of Substrate Tilting Angle on Graphene Production Through Atmospheric Pressure Chemical Vapor Deposition

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Abstract
Chemical Vapor Deposition (CVD) is a promising method for producing graphene. However, the reaction environment, such as the flow field inside the CVD reactor, remains poorly understood. Therefore, the current study focused on the influence of the substrate tilting angle on the graphene quality and elucidating the flow field around the substrate. An experiment using atmospheric pressure chemical vapor deposition (APCVD) and a simulation study of substrate tilting angle in graphene production are presented. The graphene is produced using APCVD for 8°, 15°, and 60° substrate tilting angles. The Raman characterization was done on all the substrates to see the effect of the substrate tilting angle on the graphene produced. A computational fluid dynamics (CFD) model of the heating chamber of the CVD chamber was developed using ANSYS® FLUENT to understand the result further. Simulation for the three titling angles was performed using the developed CFD model. The experimental results showed that the best result was graphene produced by tilting an angle at 15° while the lowest quality was at a 60° tilting angle. This indicates an optimum tilting angle at a lower tilting angle. The simulation revealed the relationship between vorticity and boundary layer thickness to the graphene quality.

Author Keywords
APCVD; Boundary layer; Graphene; Tilting angle; Vorticity

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