CVD graphene growth under high-precursor flux

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Chemical vapour deposition (CVD) has proven to be the best technology for achieving high-yield, electronic-grade graphene, although a subsequent transfer step is required [1] for its application. Despite industrial adoption of graphene in electronics require its production by industry-ready cold-wall reactors, which are capable of growing material under high precursor flux conditions, most CVD studies are based on lab-scale, hot-wall reactors. Hence, a comprehensive study to translate the well-known thermodynamic configuration of hot-wall reactors onto commercially available cold-wall reactor (e.g.: Aixtron Black Magic Pro) is presented [2]. In this study, the thermodynamic parameters and catalyst treatments that affect the growth dynamics and the material quality in a cold-wall reactor are analysed (Figure 1). After each material fabrication run, the lateral growth rate and the nucleation density, obtained by scanning electron microscopy and imaging techniques, are introduced into a thermodynamic model. This information can be applied to modify the growth conditions and establish a reliable material improvement path. The good quality of the single crystals obtained by this method has been confirmed using Raman spectroscopy mapping and electrical-devices characterization, ensuring high-quality material at moderate growth times.

References

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Figures

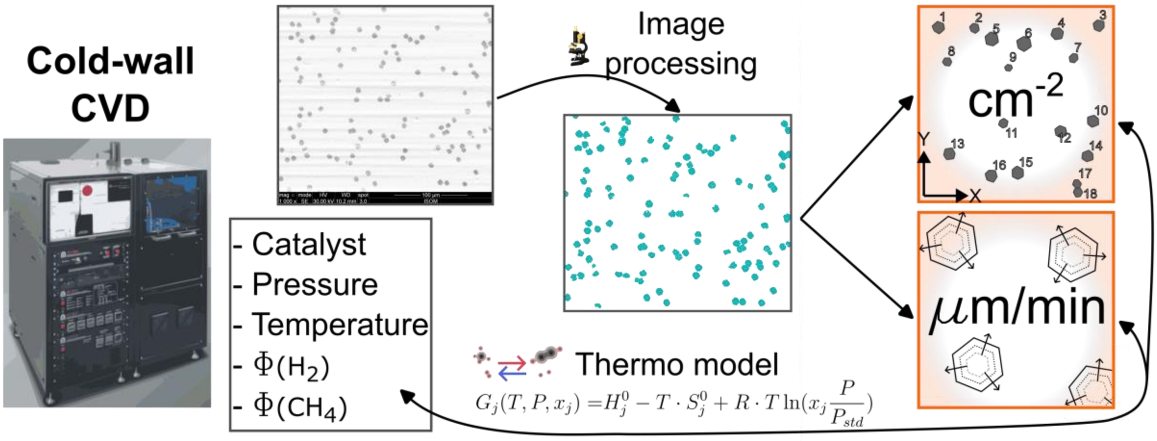

Figure 1: Graphene growth optimization. Nucleation density and individual-grain lateral growth speed are the key process metrics.