Recent advances in the liquid precursors chemical vapor deposition (CVD)

of MoS_2 on SiO_2 and on GaN

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Atomically thin molybdenum disulfide (MoS_2) is a two-dimensional (2D) semiconductor with versatile applications, thanks to its peculiar properties: direct bandgap, high carrier mobility, strong light-matter interaction. A topic of active research is the integration of this 2D material with bulk wide-bandgap semiconductors such as Gallium Nitride, to combine the functional properties of 2D layers with the well-assessed electronic quality of semiconductor substrates. Chemical Vapour Deposition (CVD) is a reliable method to prepare Monolayers (ML) of MoS_2: the recent adoption of liquid molybdenum precursors allows to have reproducible wafer-scale synthesis of such structures. I will first present the fundamental features of the CVD growth of 2D MoS_2 assisted by metal liquid precursors on SiO_2/Si substrates. Then, I will show how the MoS_2/GaN heterostructure can be prepared: i) by direct CVD growth on GaN and ii) by mechanical transfer of MoS_2 on GaN surfaces. Fundamental properties of these structures, based on characterization data, will be presented. Finally, some conclusions on strengths and weaknesses of both approaches will be drawn.

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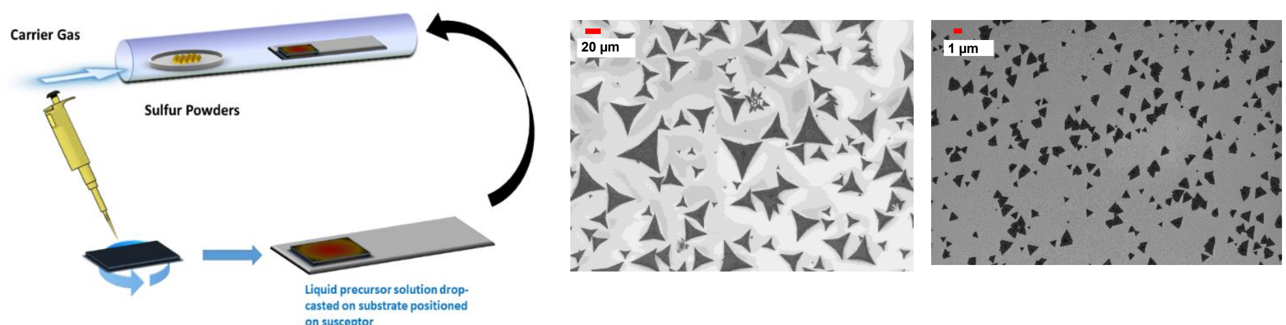

(Left) CVD system schematic; SEM images of MoS_2 grown on SiO_2/Si (Center) and on GaN (Right).