Morphological Analysis of CVD-grown 2D Dendritic Crystal MoS_2

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Abstract

The morphology of two-dimensional MoS_2 significantly tunes its vibrational and optical properties by modulating strain, the number of edge sites, and defects. In this work, we grow dendritic MoS_2 crystals on an amorphous SiO_2/Si substrate, showing the six-fold symmetry, using the atmospheric-pressure chemical vapour deposition technique. The topological and morphological structures were analysed using atomic force microscopy and scanning electron microscopy, respectively, revealing the thickness and fractal dimension. The morphology of MoS_2 changes from triangular to dendritic under different growth conditions, significantly increasing the number of edge sites and defects and thereby altering its vibrational and optical properties. This morphology also improves the surface reactivity and light matter interaction. Consequently, the material is promising for sensing, catalysis, and optoelectronic applications.

References

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Figures

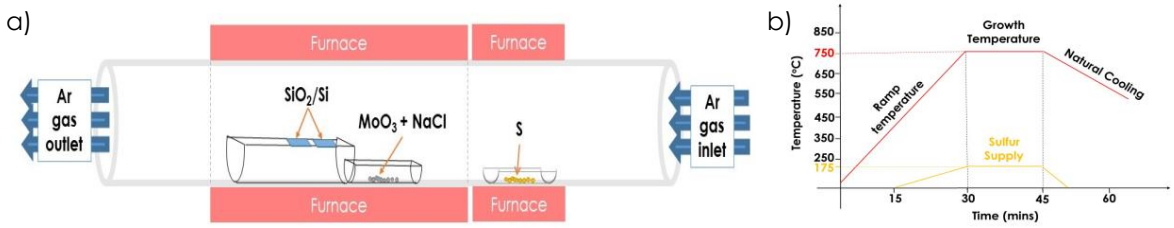

Figure 1: a) Schematic diagram of the CVD technique, and b) Temperature profile of MoO_3 and Sulfur precursors.

Figure 2: Optical image of AP-CVD-grown dendritic MoS_2.