

# Highly oriented Cu templates sputtering deposition for graphene CVD growth

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High-quality graphene growth (single-layer, continuous, single-domain) is traditionally achieved by ultra-high vacuum (UHV) chemical vapor deposition (CVD) on transition metal single crystals. The choice of materials with low carbon solubility favors the growth of a single graphene layer, as in the case of copper, which is used for the “classic” CVD growth of large-scale graphene, and which has the advantage not reacting with carbon to form carbides. Optimization of large-scale graphene has been carried out in the laboratory for 12 years on polycrystalline copper foils, with the presence of multilayers and wrinkles.

As an alternative route, we propose the sputtering growth of epitaxial copper “templates” on sapphire of a quality comparable to that of a bulk copper single crystal, to further control the quality of the graphene produced by CVD. A systematic study carried out over the past year on the templates, using structural and morphological characterization techniques, has shown the influence of the substrate orientation, thickness and deposition temperature on the surface roughness and the size, the number and orientation of the copper grains. We present the first results obtained after CVD growth of graphene on copper foil and template.

This topic follows on from collaborations with ONERA, CEA Saclay, ESRF, Spintec and Institut P’ laboratories, which have led to the development of highly textured, atomically flat thin films (Ni,Co,Pt) by sputtering, as an alternative to very expensive single crystals for the growth of 2D materials (graphene, MoS<sub>2</sub> and TaS<sub>2</sub>, hBN).