Graphene growth on electrodeposited polycrystalline copper and ruthenium

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Graphene grown by CVD on Cu foils has generated interest due to low cost and the prospect of large-area monolayer coverage. The initial nucleation and growth dynamics of graphene play a critical role in determining the final film quality. However, such characteristics are dependent on Cu surface structure, suggesting that the underlying Cu substrate has a detailed influence on the nucleating carbon species during growth [1,2]. Copper (about 40 μm thick) and ruthenium coated (about 1 μm thick) copper foils were prepared by electrodeposition in acid electrolyte. Graphene synthesis on freestanding metallic foils was carried out in a hot-wall tube furnace with CH4 and H2 gases at about 1000 °C.
In this work, we investigate the effects of the electrochemical synthesis onto graphene quality, showing the influence of the Cu-Ru interdiffusion. The growth of good quality graphene layers is also discussed in terms of the role played by grain boundaries and diffusion at the grain boundaries. Our results demonstrate the synthesis of graphene on Cu with presence of the D-peak and with the 2D-peak not higher than the G-peak (shifting of the 2D-peak) and on Ru with a high D-peak but with the 2D-peak still higher than the G-peak. Graphene on Ru coated copper has a negligible D-peak and the 2D-peak is higher than the G-peak.

References

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