Epitaxial Al_2O_3(0001)/Cu(111) Template Development for CVD Graphene Growth

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SUPPORTING INFO

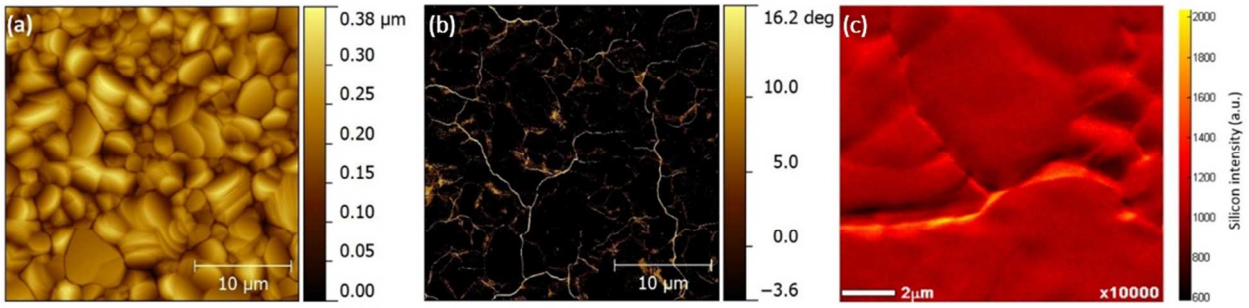

Figure S1: AFM topography (a) and corresponding phase image (b) after graphene growth on Si/SiO_2(300 nm)/Cu(500 nm). The pronounced Cu grains are clearly visible in the topography image and the phase image clearly shows a graphene sheet which is not completely closed after growth. (c) Field emission Auger electron spectroscopy mapping of an area with a graphene crevice. At the position of the crevice, a higher Si Auger signal is clearly present.

Figure S1 shows a topography (a) and phase (b) AFM image of graphene grown in our lab on top of a Si/SiO_2(300 nm)/Cu(500 nm) template using typical graphene growth conditions in a CH_4:H_2:Ar atmosphere at 920 °C. Besides the polycrystalline nature of the Cu layer, the phase image reveals that the graphene is not completely closed, as already shown in previous work.[1,2] The formation of these crevices is independent on the gas ratios.[1] The origin of this feature was identified with field emission Auger electron spectroscopy measurements (JEOL JAMP - 9500F), which unambiguously showed that Si diffusion occurred at the position of these crevices (see Figure S1c). This Si diffusion impedes the formation of closed graphene sheets and also the polycrystallinity is an issue.

REFERENCES

(1) Tao, L.; Lee, J.; Chou, H.; Holt, M.; Ruoff, R. S.; Akinwande, D. Synthesis of High Quality Monolayer Graphene at Reduced Temperature on Hydrogen-Enriched Evaporated Copper (111) Films. *ACS Nano* **2012**, *6*, 2319–2325.

(2) Howsare, C. A.; Weng, X.; Bojan, V.; Snyder, D.; Robinson, J. A. Substrate Considerations for Graphene Synthesis on Thin Copper Films. *Nanotechnology* **2012**, *23*, 135601–135607.