

Shape of graphene crystals grown on platinum

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Abstract

Crystals of graphene grown on copper from methane and hydrogen often show the symmetry of the copper substrate. This transfer of symmetry is alluded to the kinetics of attachment of the carbon atoms or fragments to the graphene edge [1]. In atmospheric CVD of graphene on platinum from methane and hydrogen we seldom observe symmetries that may be alluded to the substrate. In Fig. 1 we present a result grown from 5 sccm CH₄ and 200 sccm hydrogen at 1040° C for 30 minutes. The fourfold symmetry may be due to the symmetry of the substrate.

At higher hydrogen to methane ratios we never see fourfold symmetries. At 5 sccm methane and 800 sccm hydrogen at 1040°C for 30 minutes we obtain either irregular shaped crystals or crystals with more or less straight boundaries with 120° angles, see Fig.2. This occurrence of crystals with "habit" shape we attribute to growth close to equilibrium, meaning that at an even higher hydrogen to methane ratio no growth will occur, but existing graphene will be etched away.

References

- [1] Esteban Meca et al, Nano Letters **13**, (2013)

Figures

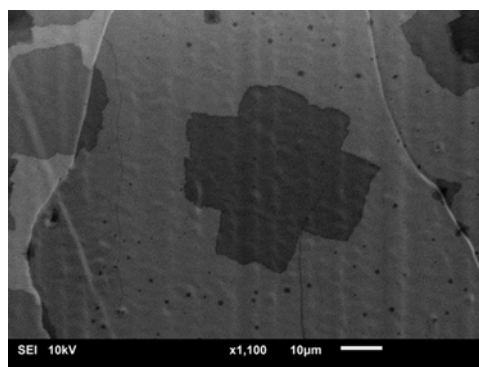


Figure 1: SEM image of graphene crystal on platinum foil using low hydrogen to methane ratio (40:1) gives a fourfold symmetry

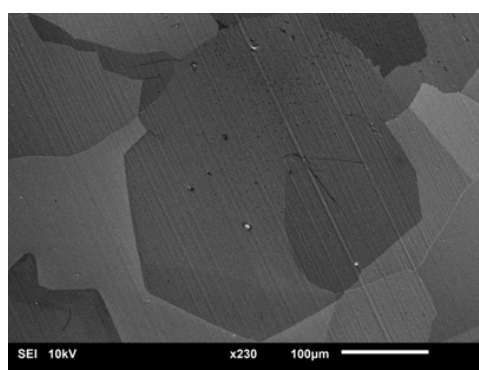


Figure 2: SEM image of graphene crystal on platinum foil using high hydrogen to methane ratio (160:1) gives the equilibrium form of the crystal in hexagonal shape
