Resolving few layer Antimonene/Graphene Heterostructures

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Two-dimensional (2D) antimony (Sb, "antimonene") recently attracted interest due to its peculiar electronic properties [1] and its suitability as anode material in next generation batteries [2]. Sb however exhibits a large polymorphic structural diversity [3], which is also influenced by the Sb's support. Thus understanding of Sb heterostructure formation is key in 2D Sb integration. 2D Sb/graphene interfaces are of prime importance as contacts in electronics and electrodes in batteries. We thus here study few-layered 2D Sb/graphene heterostructures by atomic-resolution (scanning) transmission electron microscopy ((S)TEM). In our heterostructures we find the co-existence of the thermodynamically predicted layered 2D beta Sb phase [3] but also of a metastable cubic Sb phase [4]. Both Sb phases show rotational Van-der-Waals epitaxy with the graphene support and both Sb phases are well resilient against environmental oxidation. Exact Sb growth results are sensitive on employed processing and substrate properties including notably, the nature of support type underneath the direct graphene support. Our work provides insights into the rich phase and epitaxy landscape in 2D Sb & 2D Sb/graphene heterostructures.

References

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Figures

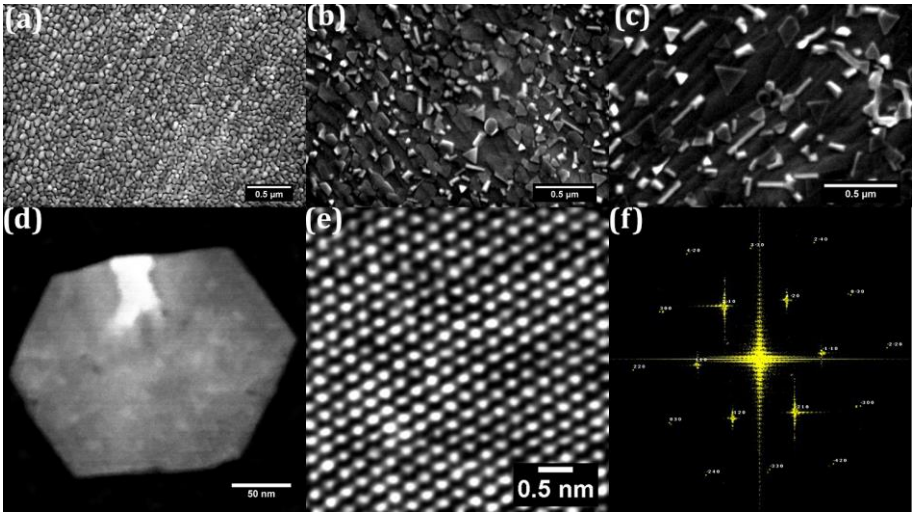

Figure 1: SEM images of morphology of 10nm Sb deposited on Graphene at RT(a), 150°C (b), 250°C (c). (S)TEM (d, e) and FFT (f) studies of one of hexagonal Sb morphology belonging to rhombohedral beta phase.