Mechanisms and applications for remote epitaxy of Heusler compounds

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Remote epitaxy on monolayer graphene is promising for synthesis of highly lattice mismatched materials, exfoliation of free-standing membranes, and re-use of expensive substrates. However, due to contaminants at the transferred graphene/substrate interface, other mechanisms such as pinhole-seeded lateral epitaxy often dominate rather than the intrinsic growth via remote interactions [1]. I will describe our understanding of the synthesis science of remote epitaxy, focusing on III-V semiconductors and Heusler compounds [1,2]. I will also show how exfoliated free-standing membranes of rare earth Heusler compounds can be used to tune (flexo)magnetism and novel superconductivity [3,4].

[1] S. Manzo, et. al., Nature Commun., 13, 4014 (2022).
[2] D. Du et. al., Nano Lett. 22, 21, 8647 (2022).
[3] D. Du, et. al., Nature Commun., 12, 2494 (2021).
[4] D. Du, e. al. APL, 122, 170501 (2023).

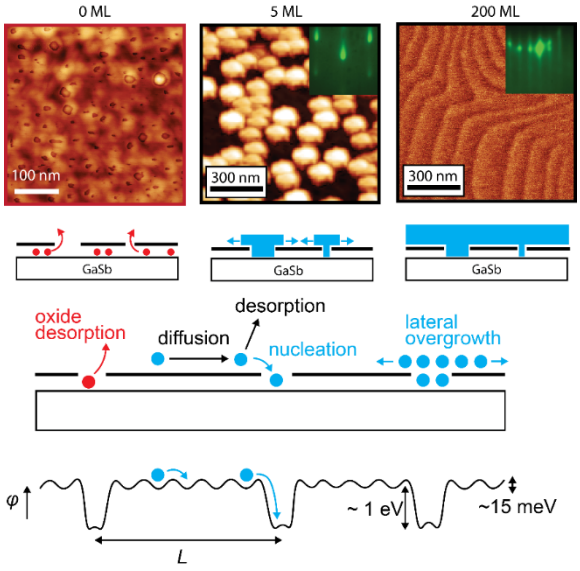

Figure 1. Pinhole seeded lateral epitaxy. S Manzo, et. al., Nature Commun 2022.

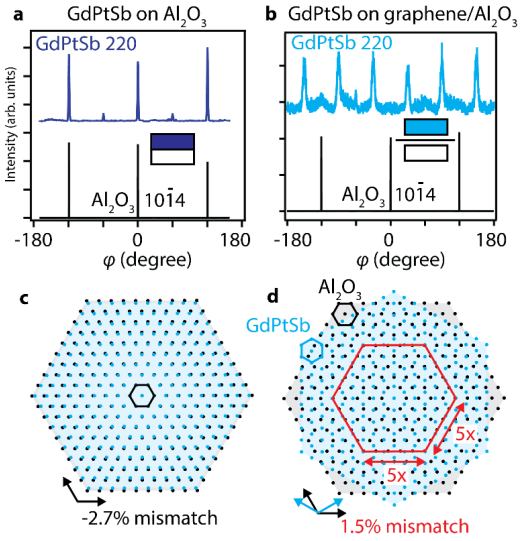

Figure 2. Epitaxial rotation of GdPtSb on graphene/sapphire. D Du, et. al., Nano Lett 2022.

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