



Selectivity Map for Molecular Beam Epitaxy of Advanced III–V Quantum Nanowire Networks

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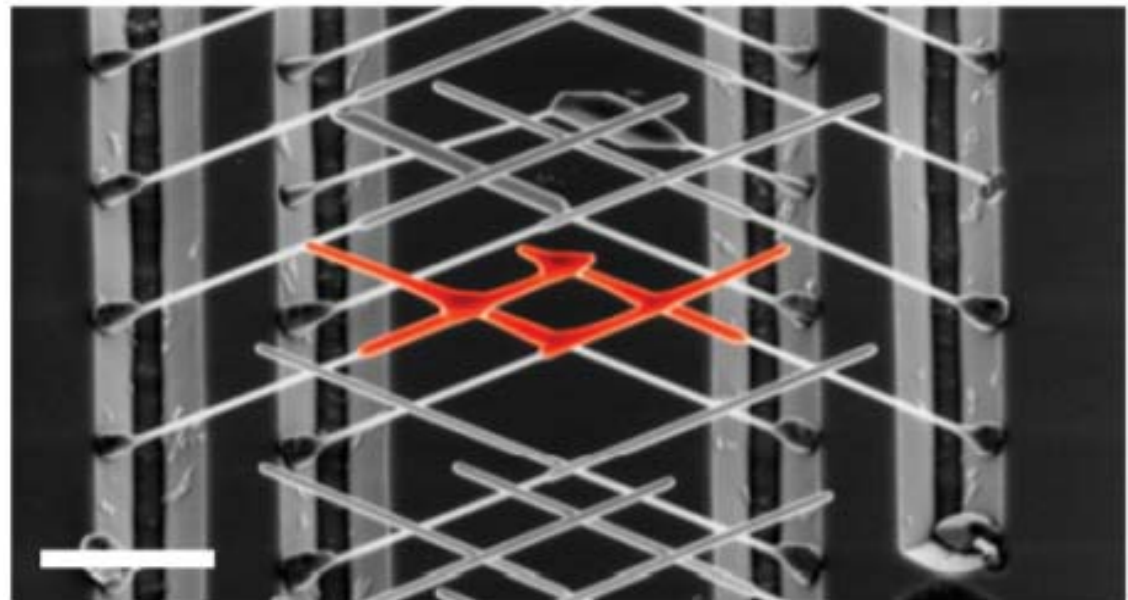
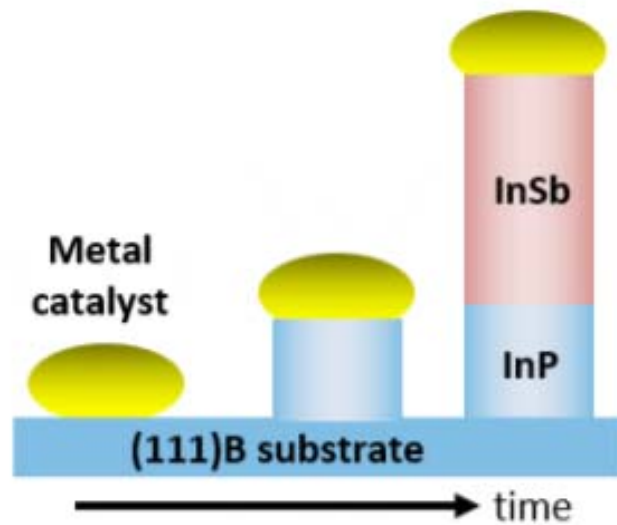
[#]ICREA, Passeig de Lluís Companys 23, 08010 Barcelona, Catalonia, Spain

Motivation

- Hybrid superconductor/semiconductor NW
 - potential to host Majorana zero modes
- SAG & MBE
 - no limitation in number of interconnections
 - scalable

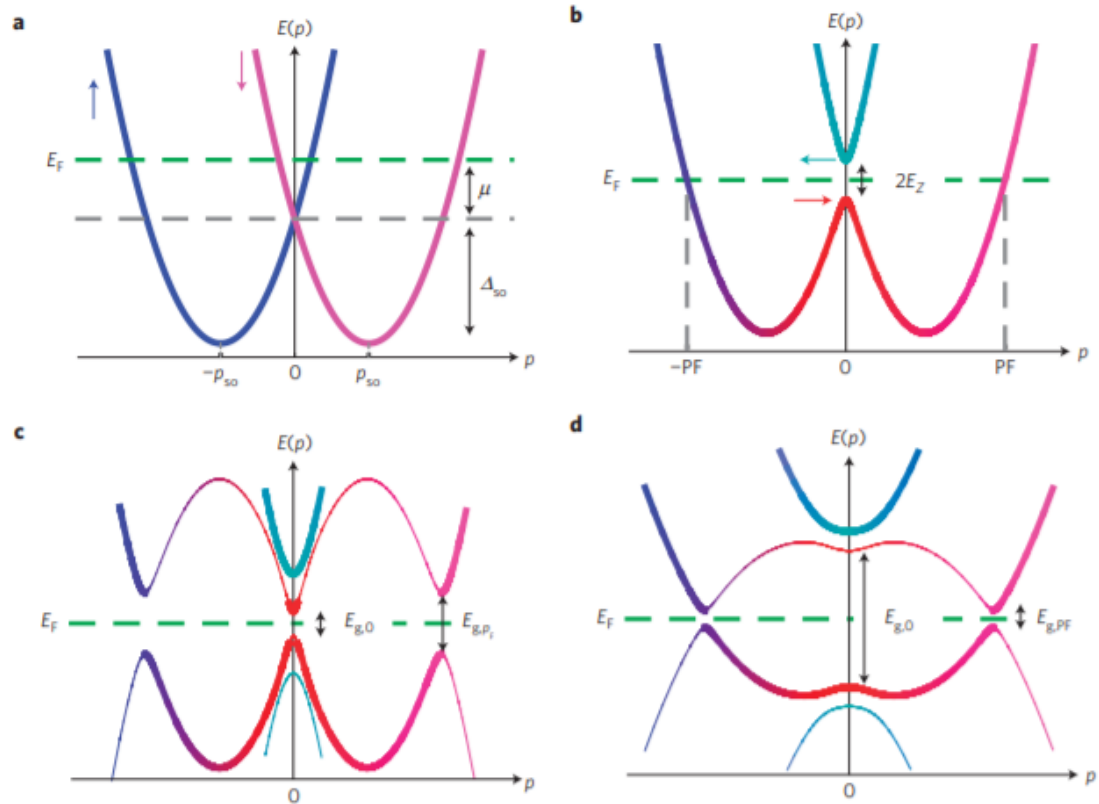


Vapor liquid solid method



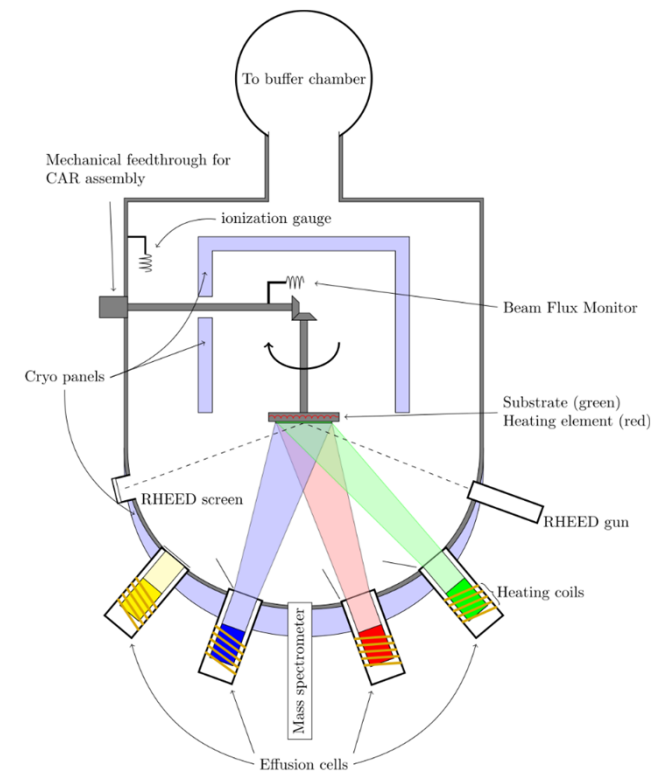
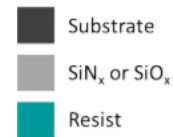
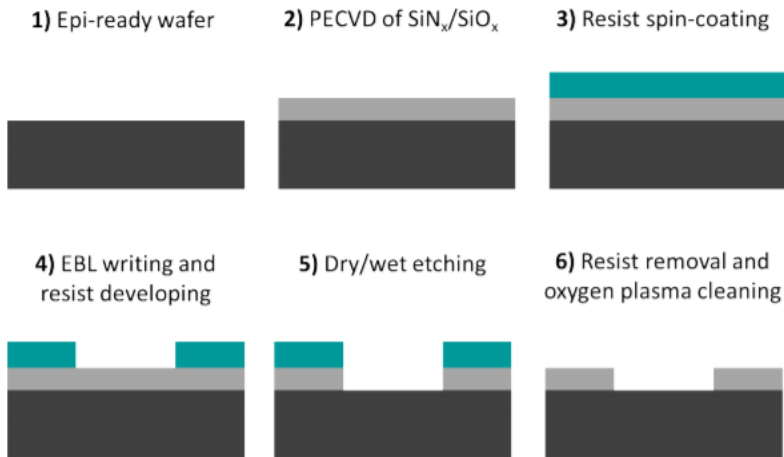
Lutchyn, R. T., Bakkers, E. P. A. M., Kouwenhoven, L. P., Krogstrup, P., Marcus, C. M., & Oreg, Y. (2018). Majorana zero modes in superconductor–semiconductor heterostructures. *Nature Reviews Materials*, 3(5), 52-68.

Potential for Quantum Computing



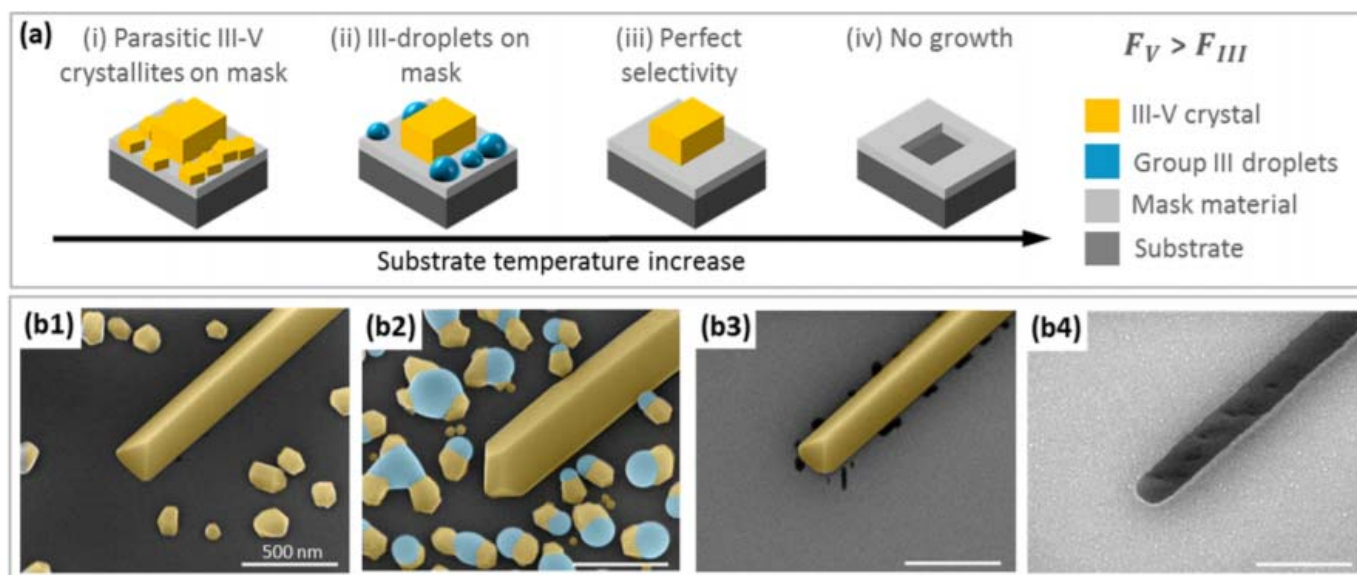
Das, A., Ronen, Y., Most, Y., Oreg, Y., Heiblum, M., & Shtrikman, H. (2012). Zero-bias peaks and splitting in an Al-InAs nanowire topological superconductor as a signature of Majorana fermions. *Nature Physics*, 8(12), 887-895.

Growth Principle



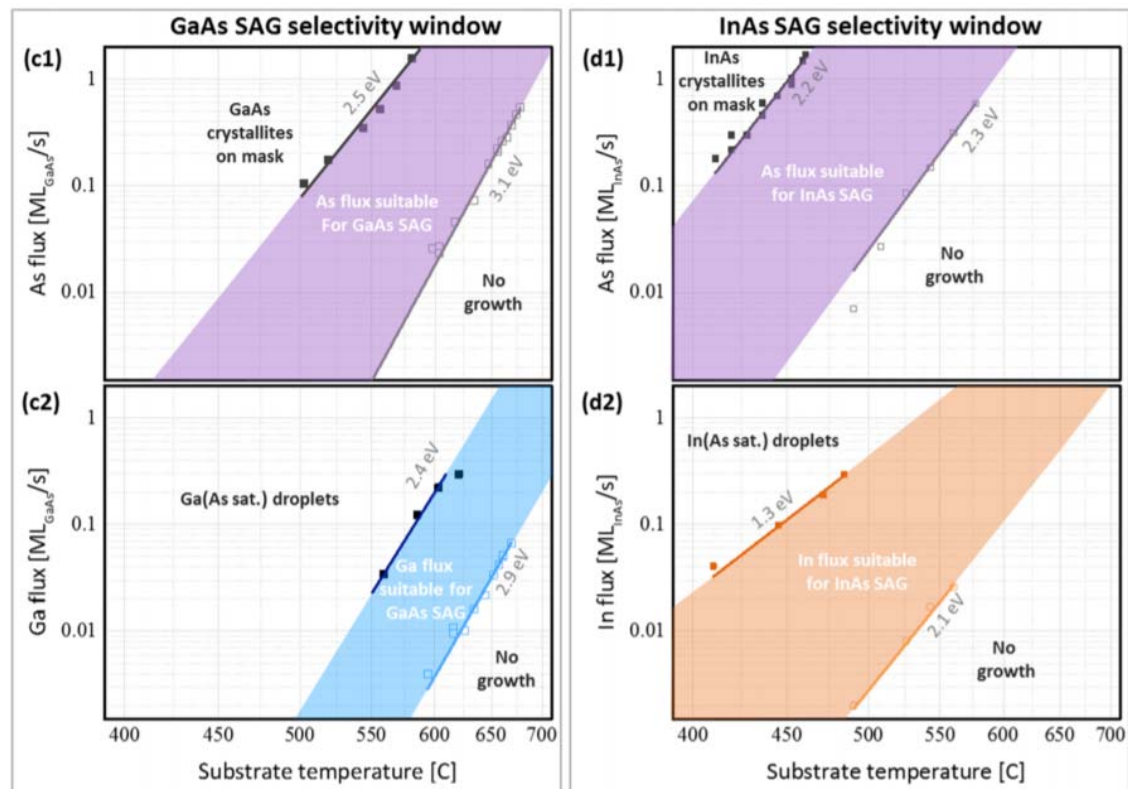
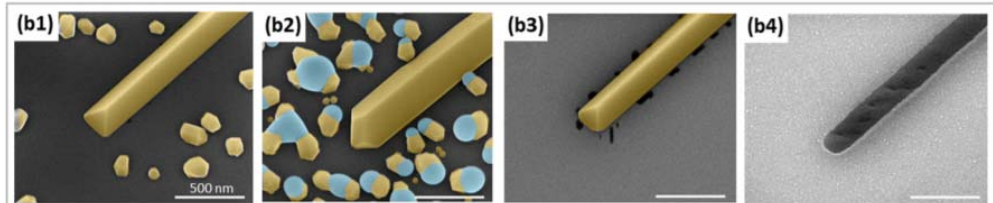
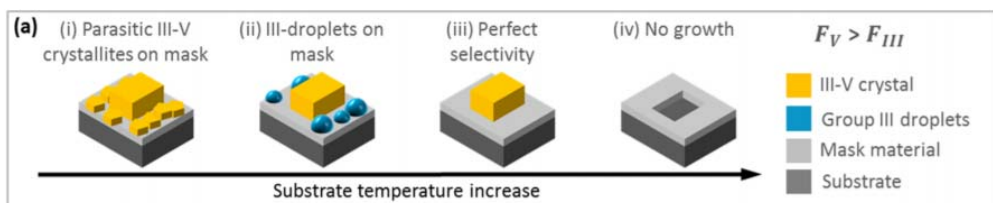
[1] ASEEV, Pavel, et al. Selectivity Map for Molecular Beam Epitaxy of Advanced III–V Quantum Nanowire Networks. *Nano letters*, 2018, 19. Jg., Nr. 1, S. 218-227.
[2] Vegar Ottensen, A MBE reaction chamber concept drawing.

Results



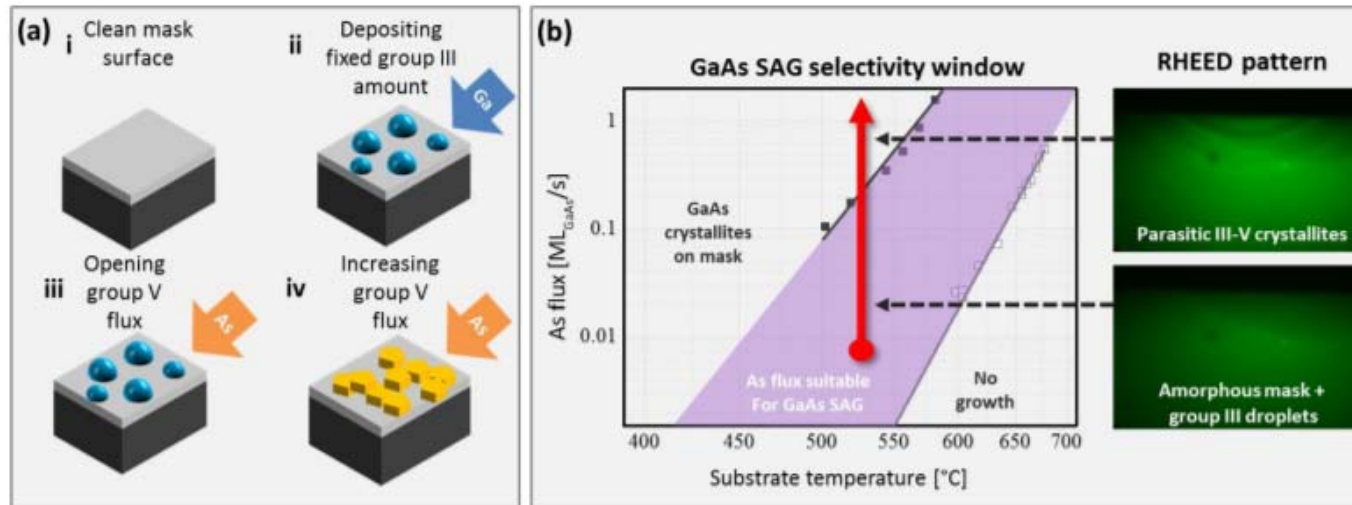
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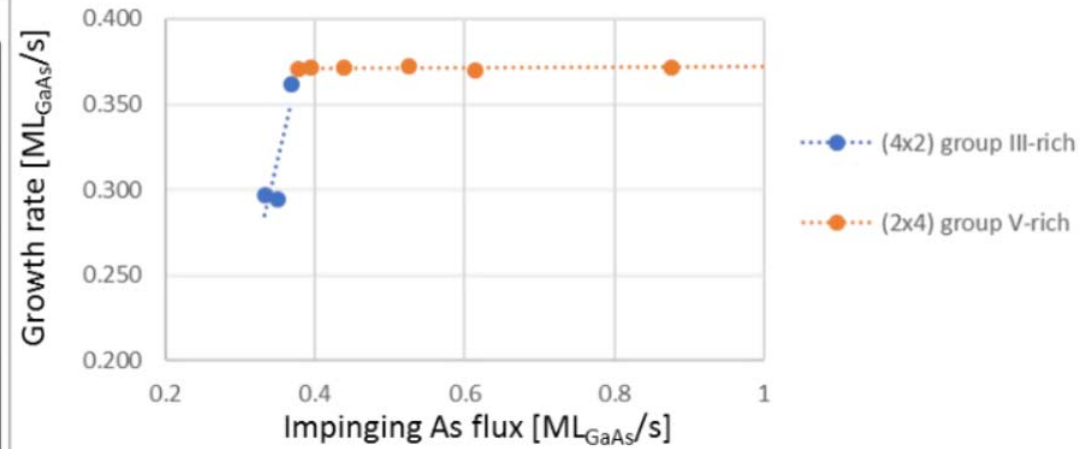
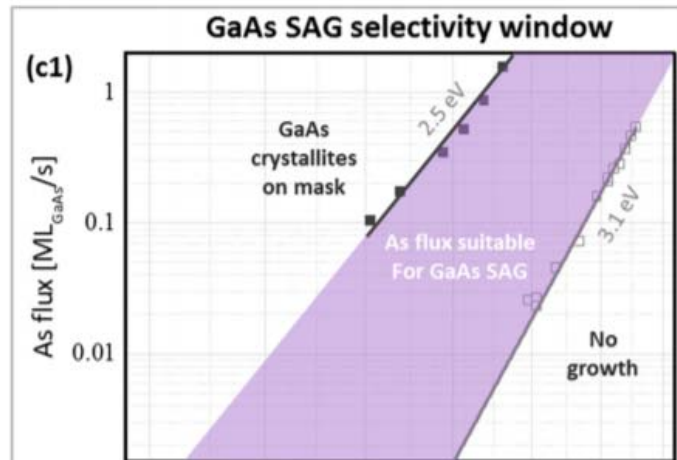
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How they obtained those results



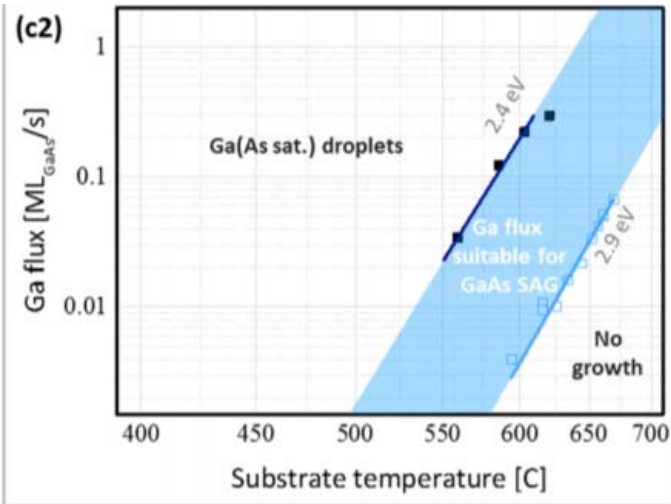
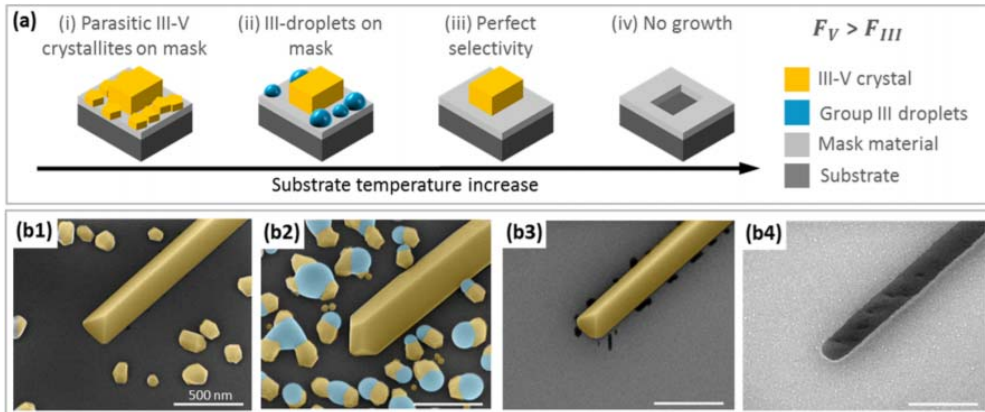
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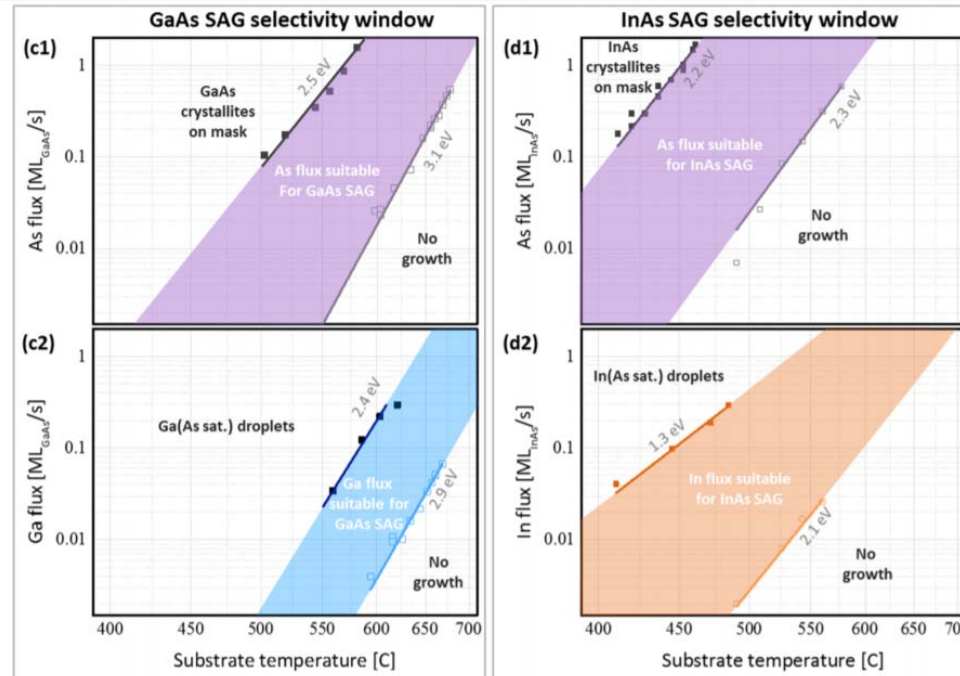
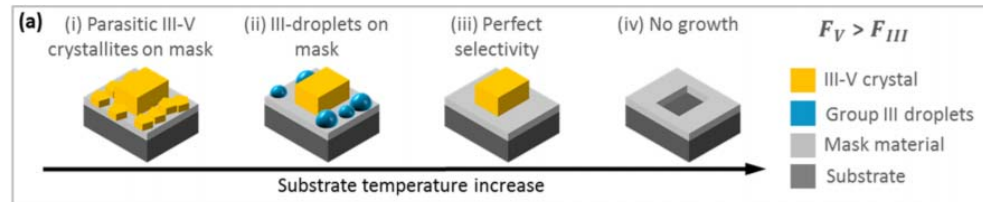


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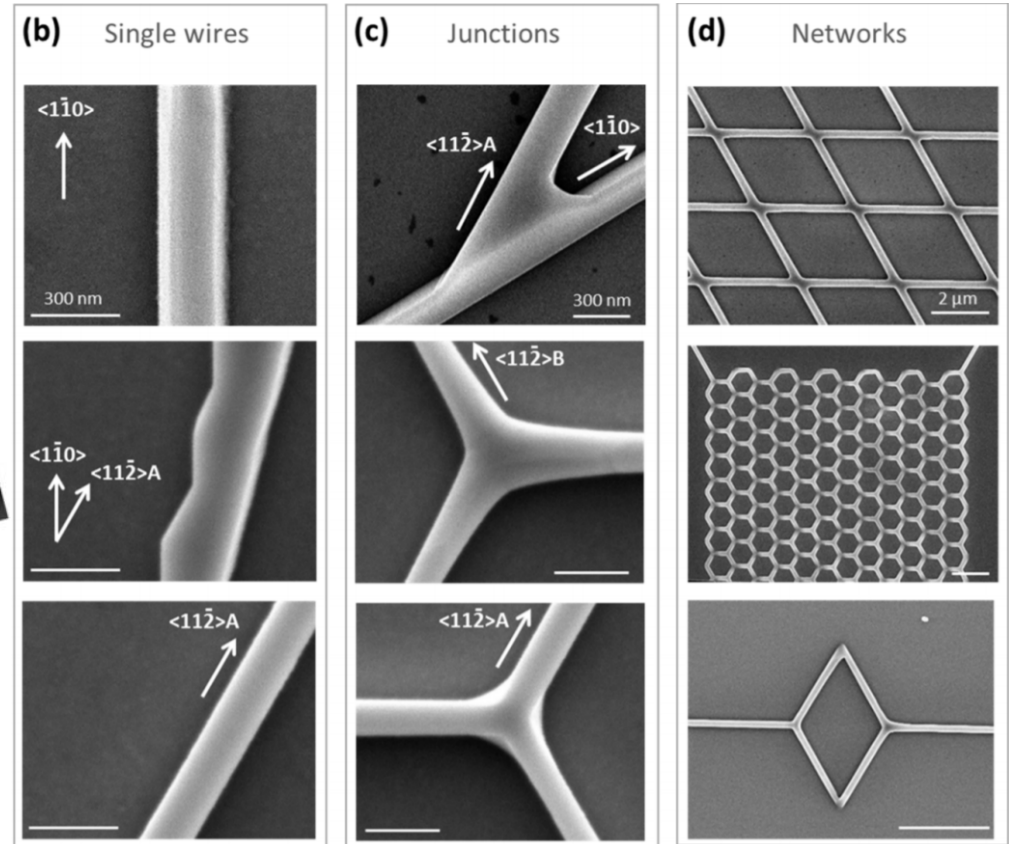
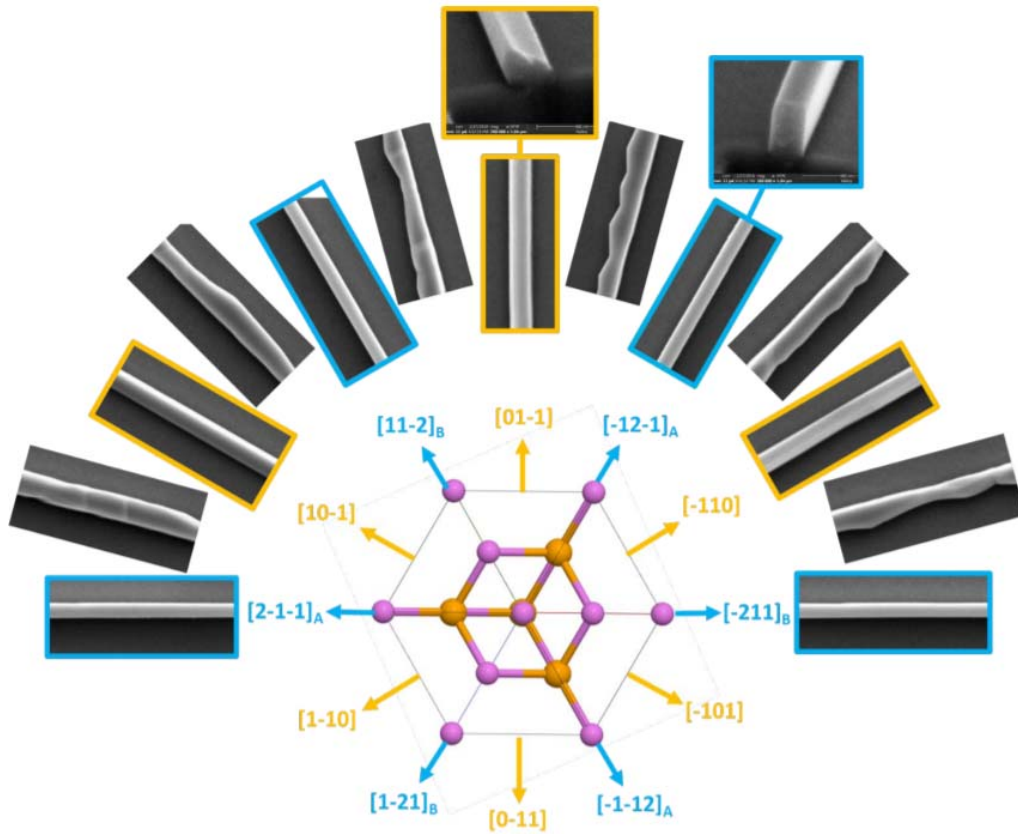
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Results

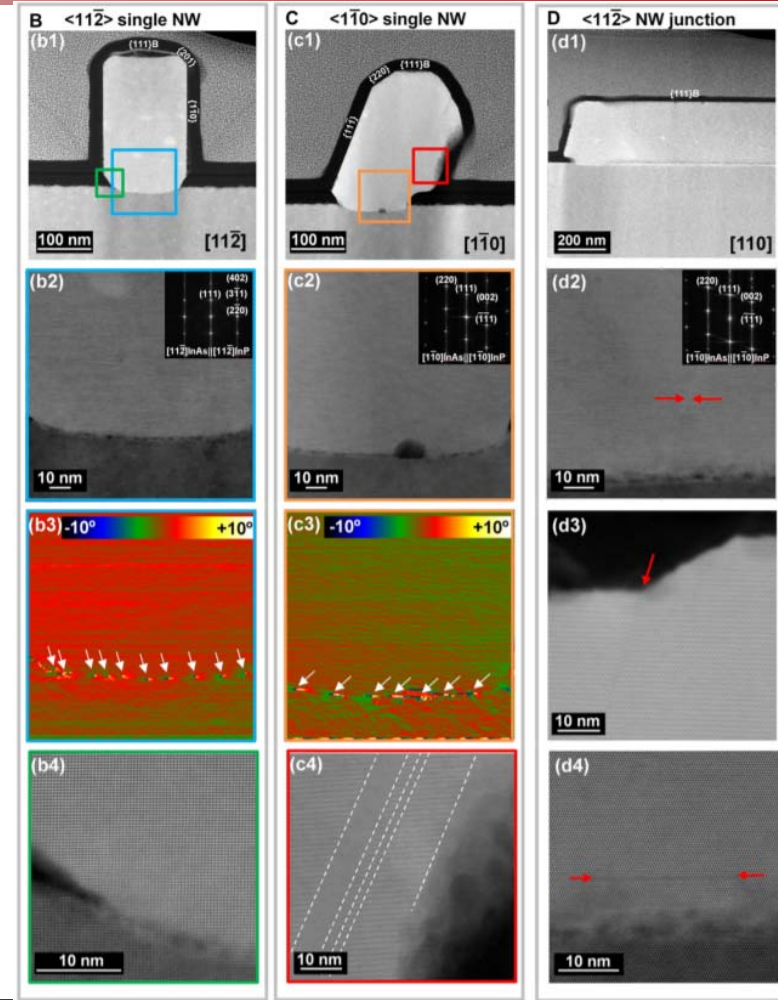
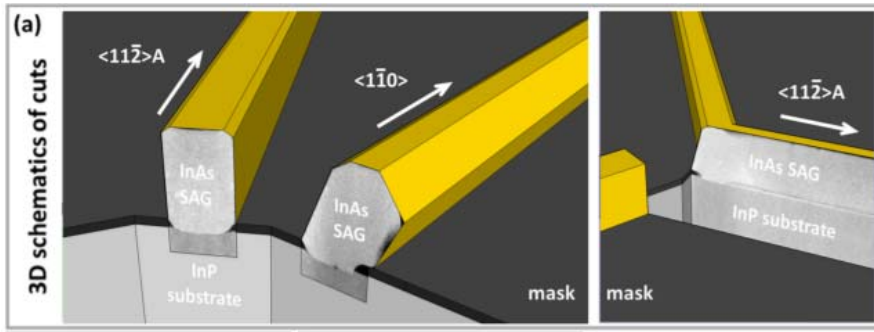


Importance of Growth direction



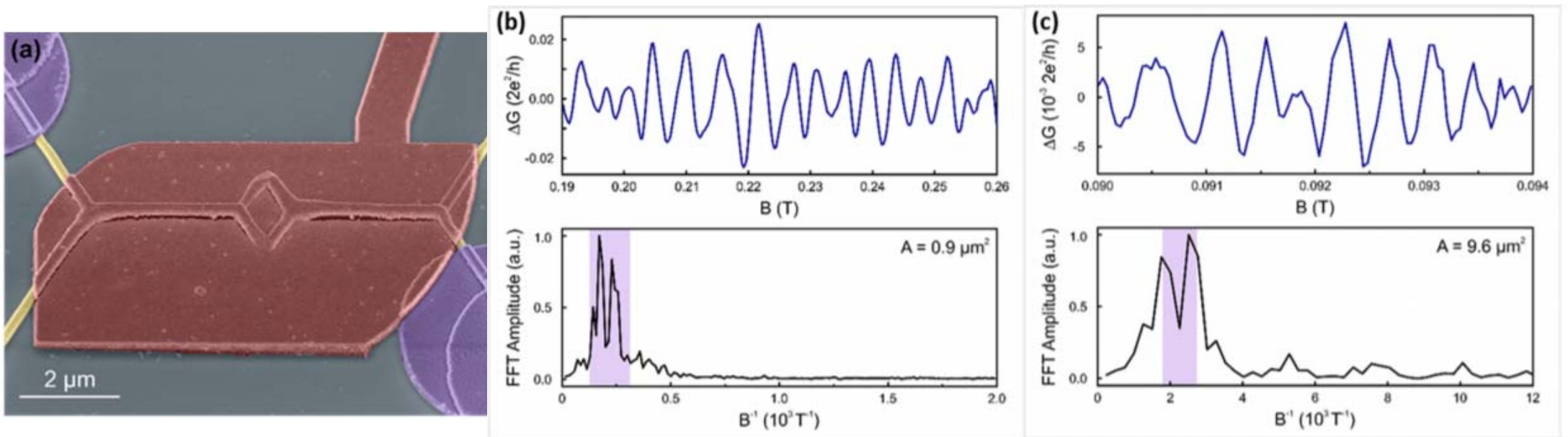
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TEM Images of NW



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Aharonov-Bohm effect



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Conclusion

- Showed a selectivity map for SAG of III-V materials
- Realized nearly defect free InAs networks with different complexity and shape
- Demonstrated phase coherent electrical transport

