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Electric field effect on Au-assisted III-V nanowire growth

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Nanowires are typically grown either as top-down etching nanostructures from a bulk or thin film material or bottom-up providing specific precursors at raised temperatures for vapour phase growth. The latter is commonly used as it provides the highest degree of control and invites to material engineering by changing the growth parameters: temperature and pressure [1].

Other parameters can also manipulate crystal growth such as an electric field, which has previously been used to control growth direction and measure surface tension of Au-catalysed silicon nanowires [2]. Recently, we have introduced microfabricated Si-cantilevers (Fig. 1a) for III-V nanowire growth using a unique ETEM with a purpose built gas handling to measure surface tension [3, 4].

In this study, we investigate how the electric field can be used on other things such as crystal phase transition and crystal stability of III-V nanowires. We will present videos and findings from our *in situ* study of III-V nanowire growth. These results include circulation of the applied bias from positive to negative bias deforming the nanowire shape (Fig. 1b-e), etching of the nanowire (Fig. 1f-g) , narrowing the nanowire (Fig. 1h) and terminating growth by removing the catalyst (Fig. 1i-j).

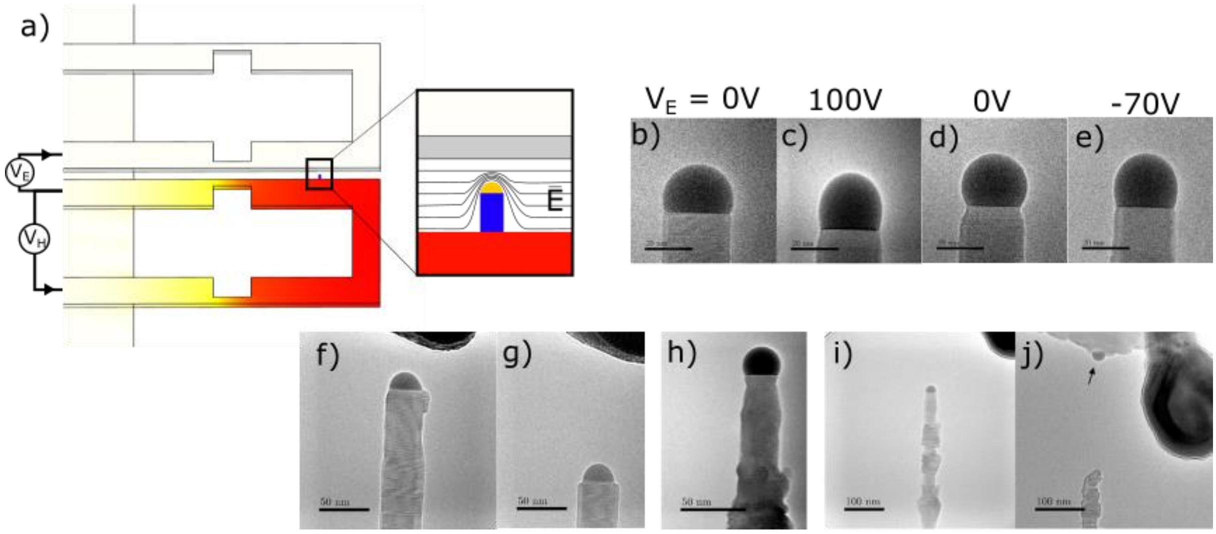

Figure 1. *Illustration of cantilever device with an electric field applied onto a nanowire (inset). Different results from applying an electric field to the droplet without (b-g) and with (h-j) a Ga-atmosphere. (b-e) droplet deformation at increasing and decreasing applied bias. (g-h) etching of a nanowire at high negative field. (g) Nanowire narrowing during growth when applying a high positive field. (h-i) Growth terminated after applying a high electric field.*

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