

Supporting Information

Wire Growth Parameters. Silicon wires ranging from 40-100 μm in length were fabricated by the vapor-liquid-solid (VLS) growth technique through the use of an in-house reactor.¹ The growth substrate was a p+ Si (111) wafer (resistivity $<0.005 \Omega \text{ cm}$) that had been coated with a 300 nm thermal oxide layer. Photolithography was used to pattern a hexagonal array of circular holes in the photoresist layer with a 7 μm pitch, and the exposed oxide regions were then etched in buffered hydrofluoric acid (Transene, used as received) to expose the underlying Si substrate through the resulting holes in the oxide. The Cu growth catalyst was deposited into the holes at a thickness of 400 nm via electron beam evaporation followed by lift-off of the photoresist layer. All of the growth runs included a 20 min pre-growth annealing in $\text{H}_2(\text{g})$ at 1000 $^\circ\text{C}$. Si microwires were then grown on the patterned Si substrates at 1000 $^\circ\text{C}$ using 25 sccm SiCl_4 as a precursor, 3 sccm BCl_3 as a p-type dopant, and 500 sccm hydrogen as a carrier gas. The growth times were between 10 and 40 min, with the longer growth times producing longer Si microwires.

Lateral Ordering. Due to van der Waals interactions with the substrate, the microwires retained their lateral ordering when the magnetic field was applied. This behavior allowed for control over the density of the final vertical ensemble of microwires by control of the initial packing density of the microwires. Supporting Information Figure 1 depicts a wire sample before and after vertical alignment, showing that the pattern of the microwires was retained during the application of the magnetic field. Representative microwires have been marked for reference. Additionally, by aligning the microwires on a substrate, magnetic agglomerates were avoided, because the wires could not translate in solution nor aggregate. Minimization of

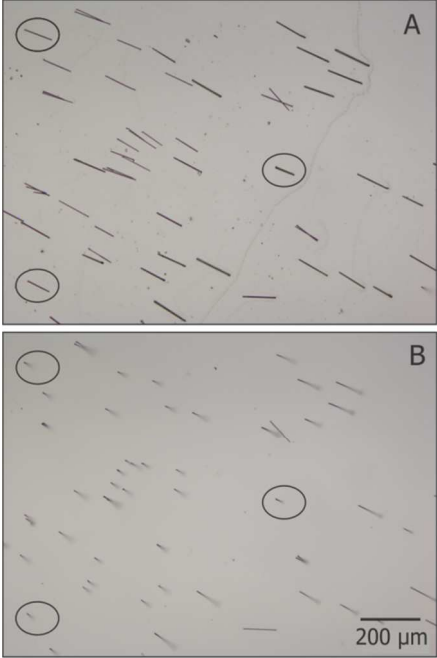
agglomerates is desirable, due to the difficulty in separating wires after they have come into mutual physical contact.

Supporting Information Figure Captions

Supporting Information Figure 1. Optical micrographs illustrating the lateral position of the wires in the same sample with the field turned off (Panel A), and with the field applied normal to the surface (Panel B).

Supporting Information Figures

Supporting Information Figure 1.



Supplementary References

(1) Kayes, B. M.; Filler, M. A.; Putnam, M. C.; Kelzenberg, M. D.; Lewis, N. S.; Atwater, H. A. Growth of Vertically Aligned Si Wire Arrays over Large Areas ($>1 \text{ cm}^2$) with Au and Cu Catalysts. *Appl. Phys. Lett.* **2007**, *91*, 103110-1-3.