Vortex transport in superconducting W-C nanostructures

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The quantized nature of superconducting vortices in Type II superconductors makes them appealing candidates for the transfer of information in the form of discrete packets. In this contribution, we report the fabrication and investigation of superconducting nanowires (NWs) in which nonlocal resistances, generated solely by vortex motion, are detected in areas depleted of current. Specifically, by perpendicularly injecting a driving current at one end of NW, a Lorentz force is exerted on the present vortices, which push neighboring ones along the long axis of the NW. Vortices passing through the opposite end, free of current, generate measurable nonlocal voltages. [1]

The nanowires have been fabricated by means of Focused Ion Beam Induced Deposition, using a focused ion beam to decompose an organometallic gaseous precursor previously adsorbed onto the substrate surface. We have used $W(CO)_6$ as a precursor in combination with two different charged particles: Ga^+ ions, which are known to yield superconducting W-C [2] and are whose properties have been thoroughly studied by the group [3-5]; and He^+ ions, for which the group has shown that superconducting nanostructures are also obtained [6-7], and whose reduced beam size and scattering allow for patterning resolution down to a few nanometers. [8]

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References

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