From Random to Controlled Nanowire Networks

Sébastien Plissard

sebastien.plissard@laas.fr
Laboratoire d'analyse et d'architecture des systèmes, 7, avenue du Colonel Roche BP 54200 31031 Toulouse cedex 4, France

ABSTRACT

Signatures of Majorana fermions have recently been reported in an InSb single-nanowire device. [1,2] In order to prove the non-abelian properties of Majorana fermions, it is necessary to perform logical operations by interchanging the positions of the two Majoranas.[3] This is not possible in a single InSb nanowire; Majorana fermion is its own antiparticle so when two Majoranas meet they annihilate. Therefore, more complex structures are needed.

We have investigated the formation of X- and T- shaped InSb nanowires from an early random process, to a cotroled one. Depending on the meeting angle of the two wires, these structures can be single crystalline. We are now developing a method to increase the yield of single-crystalline crosses. With this method we can also make nanowire networks. First electrical measurements done on these nanostructures will be discussed. Hall effect measurements at low temperature prove the high quality of these new structures.

REFERENCES

[1] V. Mourik; K. Zuo; S. M. Frolov; S.R. Plissard; E. P. A. M. Bakkers; L. P. Kouwenhoven Science 2012, 336, 1003
[2] S.R. Plissard; D. R. Slapak, M. A. Verheijen; M. Hocevar; G. W. G. Immink; I. van Weperen; S. Nadj-Perge; S. M. Frolov; L. P. Kouwenhoven; E. P. A. M. Bakkers Nano Lett. 2012, 12, 1794
[3] J. Alicea1, Y. Oreg, G. Refael, F. von Oppen and M. P. A. Fisher, Nature Physics 2011, 7, 412