

Porous silicon templates for superconducting devices

Carmine Attanasio¹

Serghej L. Prischepa²

2018

¹Università degli Studi di Salerno, Fisciano, Italy

²Department of Telecommunications, Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus

Keywords: Porous silicon template, Ultrathin superconducting film, Matching effect, Nanowire network, Thermal fluctuations, Quantum tunneling.

Abstract. The use of porous silicon (PS) templates in the field of superconducting nanoelectronics is reviewed. We focus on the influence of the morphology of the pores (porosity, average pore diameter) on the superconducting properties of ultrathin films deposited on these templates. We describe and discuss some basic and advanced properties of the obtained nanostructured superconductors. In particular, we show that, due to the extremely reduced dimensions of PS templates, the formation of commensurate vortex structures can be realized at low temperatures and at matching fields as high as $\mu_0 H_1 \approx 1$ T. We also show that with this fabrication procedure, we can obtain networks of one-dimensional superconducting nanowires, which exhibit features typical of quantum phase slip (QPS) phenomena. This creates preconditions for the development and implementation of new highly sensitive radiation

detectors, magnetometers, QPS qubits, QPS transistors, and quantum current standards.

This article published in: Attanasio, C. Porous silicon templates for superconducting devices / C. Attanasio, S. L. Prischepa // Handbook of porous silicon / ed. L. Canham. – 2 edition. – Switzerland : Springer International Publishing, 2018. – P. 1133-1147. – DOI 10.1007/978-3-319-04508-5_106-1.