Extended Abstracts of the 2019 International Conference on Solid State Devices and Materials, Nagoya, 2019, pp167-168

Semiconductor InSb Nanolayers: A New Platform for Developments of Quantum and Topological Devices

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Abstract

Semiconductor InSb nanowires have been demonstrated as one of the most promising materials systems for realizing topological superconducting structures in which Majorana bound states can be created and manipulated [1-3]. For achieving quantum computing with Majorana bound states, an efficient scheme for braiding Majorana bound state needs to be developed. In this respect, proposals of using branched InSb nanowires and two-dimensional InSb planar structures have been envisioned [4,5]. In this talk, I will report on our recent developments in epitaxial growth of free-standing InSb nanoplates and in building quantum devices and superconducting Josephson junction devices with these InSb nanoplates [6-8]. These InSb nanoplates were grown by molecular beam epitaxy (MBE) and exhibits excellent structural and transport properties [6]. The advantages of employing these InSb nanoplates include flexibilities of transferring them to desired substrates for device fabrication and of directly contacting them with different metals and superconductors. Several quantum devices have been fabricated using our MBE-grown InSb nanoplates and have been studied by transport measurements. In particular, we will demonstrate realizations of first InSb nanoplate quantum dot devices [7] and first Al-InSb nanoplate-Al Josephson junction devices [8-10]. Perspectives of achieving topological quantum devices will also be presented and discussed. "A brief abstract of your Extended Abstract" should be included at the first part. It plays a key role in attracting the reader's interest. The text of this paragraph should be in bold font.

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