

Nanowire based spin devices : exploring the possibilities of semiconductor nanowire for spintronics

Yeongju Kang^{1*}, Nayoung Kwon¹, Joonyeon Chang¹, Jonghwa Eom^{1,2}, Hyunjung Yi¹,
Hyun Cheol Koo¹, Hyungjun Kim¹, Sukhee Han¹

1. Nano Device Research Center, Korea Institute of Science and Technology, Seoul 136-791, Korea

2. Department of Physics, Sejong University, Seoul 143-747, Korea

A quasi-one-dimensional (Q1D) system such as nanowires (NWs) has remarkable properties and potential as the building blocks for nanoscale electronic devices. It is generally accepted that 1D nanostructures provide a good system to investigate the dependence of electrical transport on dimensionality and size reduction. Therefore, a lot of studies have been recently carried out on electronic and optoelectronic devices based on nanowires. They are also expected to play an important role as functional units in fabricating spintronic devices with nanoscale dimensions because of the following reasons; First, carriers could be confined in the radial direction of nanowires without extensive spin scattering and, therefore, polarization of injected spin could be potentially persisted; second, the single crystalline nanowires could be used as model diluted magnetic system for exploring the origin of ferromagnetism in these semiconductors by excluding the extrinsic effects such as defects and secondary phases.

In the work, as a basic study, we successfully developed the experimental process to fabricate the device consisting of two electrodes connecting semiconductor nanowire. For DMS nanowires such as GaMnN, GaMnP, we have studied ferromagnetism and magneto transport features of the nanowires. On the other hand, electrical contact and transport properties were investigated for semiconductor nanowires such as GaN.

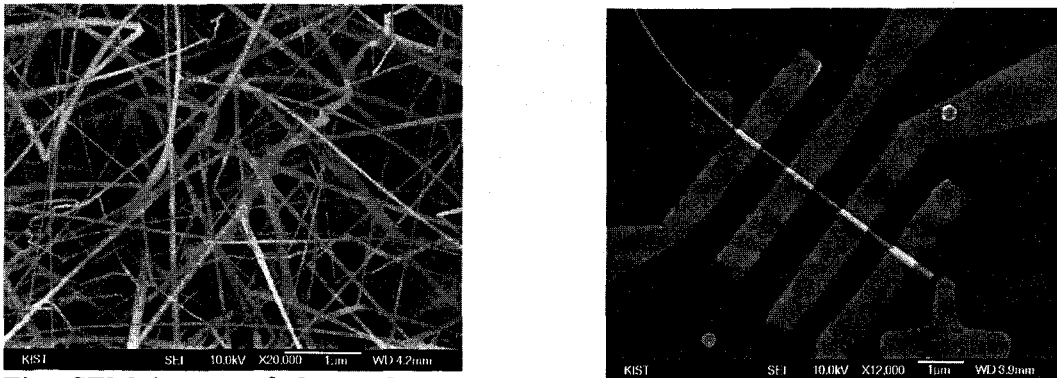


Fig. SEM image of GaMnN nanowires as-received (a) and fabricated device of nanowire (b)