ET10

Large Magnetoresistance at Room Temperature in InSb

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Magnetoresistance (MR) effects including Odinary MR, giant MR, colossal MR etc. exhibit large changes in electrical resistance according to magnetic field, which has led to great interest of scientists due to improvements in the magnetic information storage, sensors and magnetoelectronics. Specially, in manganite system showing colossal MR effect the dramatic switching of resistive states can be achieved not only by a magnetic field, but also by an electric field [1]. This current switching of resistive state has received considerable attention because of their interesting physical phenomenon and potential applications as nonvolatile memories [2]. On the other hand, magnetoresistive switch effect with large MR had been reported in the Sb/MnSb nanoclusters/GaAs system [3] and Au/GaAs Schottky diode [4]. In this report, we have studied a large magtoresistance in as-grown InSb. Samples of InSb (1.3 um) were grown by MBE on GaAs substrate. We were fabricated Induim electrode by E-beam lithography and evaporation. The mobility of our sample is about 4.0 [m2/Vsec] at 300 K. Our device shows a large magnetoresistance change and threshold magnetic field can be tunable by a bias voltage on the device at 300 K in Fig 1. Thus, the conducting state of our device is convertible from low resistive state to high one and this change is governed by magnetic field. Current in this device can be increased more than 100 mA, but the amount of current is limited in this data to protect the device from high-current damage. All of the observed curves are successfully recovered when sweep direction of magnetic field is reversed. This electrical switching device can be good candidate for a future reprogrammable electronic device.

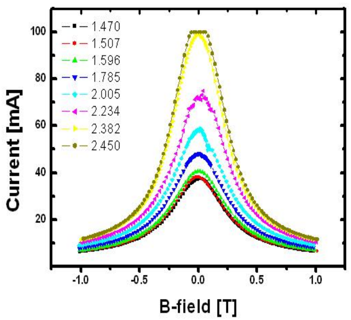

Fig. 1. Current verse magnetic field for various bias voltage when magnetic field is applied to perpendicular to the sample plane.

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EU01

Influence of Lattice Constant on the Left-handed Properties of Combined Structure

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Recently, a new area of research, left-handed materials (LHMs), has been investigated intensively because of their fascinating properties and novel applications. The first experimental evidence for the LH behavior was reported by Smith *et al.* [1], using the split-ring resonator (SRR) as a magnetic component for providing the magnetic resonance. Besides the SRR structure, several different designs have been proposed [2-5], such as S-shaped, Ω-shaped, π-shaped and cut-wire pair structures. The main purpose of these modified structures is to find out the optimum structure that can be easily fabricated and experimentally characterized, especially, for LHMs working at optical frequencies. In this report, we studied the influence of lattice constant on the resonance frequencies of cut-wire pair structures, which could be utilized as the magnetic components for constituting the LHMs. It was found that the lattice constants of cut-wire pair structure provide subtle effects not only on the electric-resonance frequency but also on the magnetic one. The experimental results were compared with the simulation studies. In addition, we also investigated on how this affects the LH behavior of combined structures of cut-wire pair and continuous wire. The results show the systematic changes of the LH behavior of combined structure according to the lattice constant. These structures were designed, fabricated, and measured in the microwave frequency regime.

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