## SB06

# Fabrication of Two-dimensional Magnetophotonic Crystals by Using Porous Alumina Template

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Periodic structure in combination with dielectric and magnetic elements at sub-micrometer scale, which is called magnetophotonic crystals (MPC's), is currently attractive due to their unique properties: photonic band structure for electromagnetic waves, and possibility to control propagation of light by magnetic field. Two-dimensional magnetophotonic crystals (2D-MPC's) are very beneficial because attractive applications such as magnetic controlled optical microcircuits - circulator can be created [1]. Anodized porous alumina with 2D hexagonal hole array is considered to be one of candidates to be a template for fabrication of 2D-MPC's. In this article, we report on fabrication of 2D-MPC by using porous alumina template and their magnetic properties. A Ni stamper with hexagonal array of small convexes was pressed on an electro-polished Al sheet by an oil press machine. After indentation by the Ni stamper, anodization was conducted with application of constant voltage of 160 V in 0.5 M phosphoric acid solution at 0°C for 3 hours. The porous alumina template was filled with bismuth substituted yttrium iron garnet (Bi:YIG)precursor solution which dissolved nitrate in Dimethyl formamide. Crystallization heat treatment was carried out in 750°C for 40min. Figure 1 shows cross sectional SEM image of precursor filled template. The Bi:YIG precursor is being filled to half in depth of pore. Moreover, the precursor rods are crystallized single phase garnet structure from the result of X-ray diffraction. The magnetization of Bi:YIG rods in alumina template is shown in Fig. 2, when applied field parallel to alumina surface was "Inplane" and perpendicular to alumina surface was "Outplane" described in Fig. 2. The Bi:YIG rods are ferro-magnetic, however, disappear shape anisotropy, because the Bi:YIG rods are partially amorphous.

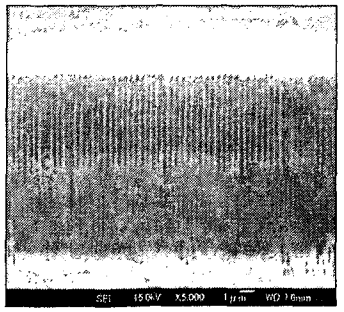

Fig. 1. Cross sectional SEM image.

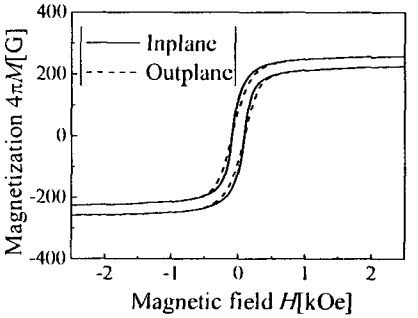


Fig. 2. Magnetic property of Bi:YIG rod array.

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## SB07

# Nickel Oxide Nanowires Prepared with Anodic Aluminum Oxide Membrane Templates

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One-dimensional (1D) nanoscale building blocks based on functional nanowires and nanotubes are of considerable interest for their potential applications in electrical, optical, optoelectronic, magnetic, biological and gas sensor devices due to the structural versatility and unique chemical and physical properties. However, the successful employment of 1D nanowires in viable device applications has been impeded by a lack of control over the precise dimensions, morphology, phase homogeneity, and chemical composition [1].

The growth of metal oxide nanowires, especially nickel oxide (NiO) nanowires, has attracted a great attention worldwide recently owing to its novel properties [2]. We have succeeded in forming 1D NiO nanowires on anodic aluminium oxide (AAO) membrane templates using nickel naphthenate as a precusor. The nickel naphthenate was diluted with toluene. The diluted nickel naphthenate solution was filled in AAO membrane templates by a doctor blade method. The filled AAO template was heat-treated at 700 °C for 5 min. using a rapid thermal annealing system under ambient atmosphere in order to transform Ni to NiO nanowires and then removed using a diluted NaOH solution. Finally, the NiO nanowires were rinsed with ethanol and dispersed on a substrate for further characterizations. Various characterizations were carried out including X-ray powder diffraction (XRD), high resolution transmission electron microscopy (HRTEM), field emission scanning electron microscopy (FE-SEM), and alternating gradient magnetometer (AGM) in order to investigate their structural and magnetic properties.

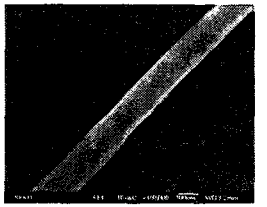

Fig. 1. SEM image of NiO nanowire.

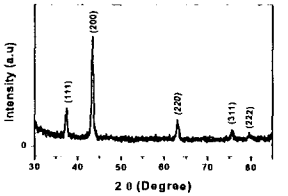


**Fig. 2.** XRD pattern of NiO nanowires.

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