

One-dimensional magnetic photonic crystals

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The magnetic and the magneto-optical properties of periodic magnetic structure, produced by the femtosecond-laser induced crystallization of amorphous Co_2MnSi films, were elucidated. The amorphous Co_2MnSi films have been prepared by rf-magnetron sputtering on a glass substrate at room temperature. In order to form a grating structure, two-beam interference of femtosecond laser pulses was employed. The atomic-force-microscopy and the transmission-electron-microscopy results show regularly-spaced alternating lines with a periodicity of 2 μm . The magnetic-force-microscopy results reveal the periodic patterns of magnetic domains. The Kerr hysteresis loops of sample were measured by using a magneto-optical microscope. The enhanced magneto-optical properties were observed for the first-order diffracted beam. It was found that the films with a spatially periodic magnetic structure can be easily fabricated by the selective crystallization of a paramagnetic Co_2MnSi amorphous film, which crystallizes into the ferromagnetic phase upon the illumination with sufficiently intense laser light.