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Non-lithographic Fabrication of Magnetic Nanodot Arrays[1] BI-CHING SHIH, University at Buffalo, the State University of New York, MIN NI, University at Albany, State University of New York, HAO ZENG, Department of Physics, University at Buffalo, the State University of New York, Buffalo, NY14260
— Highly-ordered magnetic nanodot arrays with tunable size and interdot spacing have been fabricated by electron-beam evaporation through ultra thin porous anodic alumina (PAA) templates. The PAA templates were fabricated by a 2-step anodization process in a 0.3 M oxalic acid electrolyte at room temperature, with an anodization voltage ranging from 20 to 60 V. The aspect ratio were controlled by the second anodization time. In order to get porous arrays with through holes, the aluminum layer and the barrier layer were removed by wet chemical etching. The template was then placed on a solid substrate as a shadow mask for subsequent deposition of magnetic nanodots. The magnetic properties of Ni nanodot arrays with 50 nm diameter and 80 nm spacing were studied in detail. The dots are superparamagnetic at room temperature. They become ferromagnetic at approximately 170 K. The coercivity at low temperatures is found to be much higher than that of continuous Ni films, due to a transition of magnetization reversal mechanisms from domain wall motion to spin rotation. A significant reduction in the Curie temperature is observed, which is attributed to the finite size effect.

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Hao Zeng
University at Buffalo, the State University of New York

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