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Fabrication of amorphous FeNiP nanowire arrays and the change of their properties regarding annealing

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Magnetic nanowire arrays with large wire aspect ratios are suitable for application in high density magnetic recording media, biological sensing of carbohydrates and many further research fields [1].

In this talk, the fabrication of amorphous FeNiP nanowire arrays using AAO templates will be presented. Porous Anodic Aluminum Oxide (AAO) is valued as a versatile template for surface nanostructuring [2, 3]. The AAO template enables control of regularity and shape of nanostructures by its pores which are hexagonally arranged and stand perpendicularly on an Aluminum substrate. The pore diameters used for the fabrication of nanowires are 40 nm and 250 nm. Due to a separation of pores and substrate by an insulating barrier layer of alumina, this barrier layer needs to be removed by chemical etching. Deposition of a conductive layer at the bottom side is necessary for electrodeposition and is accomplished with a physical vapor deposition system.

FeNiP nanowire arrays are prepared by filling the AAO pores via electrodeposition using a potential pulse sequence and an electrolyte at elevated temperature [4].

The structure of the nanowire arrays has been characterized by SEM and TEM. The magnetic properties of the nanowire arrays have been investigated by Vibrating Sample Magnetometer (VSM) measurements.

The nanowire arrays have been annealed and heated by in-situ TEM to study the development of crystal structure and the change of the magnetic properties.

References:

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