Supporting Information

Directed Magnetic Particle Transport above Artificial Magnetic Domains Due to Dynamic Magnetic Potential Energy Landscape Transformation

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Description of the movie file

The movie shows the stepwise transport of magnetic particles above the magnetic parallel stripe patterned exchange bias substrate with 5 µm stripe width and head-to-head/ tail-to-tail orientation of the magnetization in adjacent domains parallel to the short stripe axis. The topographically flat exchange bias thin film layer system is covered by an organic resist layer (AZ1505, purchased at MICROCHEMICALS) with a layer thickness of 700 nm. Spherical superparamagnetic magnetic core shell particles (MICROMOD GMBH) with a particle diameter of 2 µm are attracted by the domain walls of the magnetically patterned exchange bias substrate due to the spatial gradient of the sample's magnetic field landscape which is strongest above the domain walls. The directed transport of magnetic particles is induced by the dynamic transformation of the magnetic particles' potential energy landscape due to the application of a periodic external magnetic field sequence parallel (*x*-direction) and perpendicular (*z*-direction) to the sample surface. The transport direction is prescribed by the phase shift between the *x*- and *z*-component of the external magnetic field pulse sequence.