

5th International Conference on Condensed Matter & Applied Physics Dec. 12-15, 2025

Surface artificial grooving and engraving for magnetic anisotropy texture patterning

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Mode: Offline

Interested in: Poster

Abstract :

In this work, we investigate the induction of in-plane uniaxial magnetic anisotropy in permalloy thin films through Surface Artificial Grooving and Engraving (SAGE), a technique that involves the controlled nanoscale scratching of the film surface using atomic force nanolithography. This process generates a well-ordered groove array resulting in a strong uniaxial anisotropy with the easy axis aligned along the groove direction. The strength of this anisotropy is found to increase for small period and deep engraving. This approach is applied to patterned Py structures, enabling the mastering of domain arrangement and domain-wall motion. In particular, we demonstrate the design of a magnetic chessboard in ferromagnetic thin-film and the zero-field of spin wave propagation in corrugated permalloy waveguides.

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