**69**

# Reconfigurable Diffractive Optical Structures Enabled by the Magnetic Shape Memory Effect in Magnetoactive Elastomers

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A surface-relief grating with a period of 30 μm is embossed onto the surface of magnetoactive elastomers (MAE) under a moderate magnetic field of approximately 180 mT. The resulting structure, consisting of parallel stripes with two distinct reflectivity coefficients, is characterized via diffraction of a He–Ne laser beam in a reflection geometry. Owing to a magnetic-field-induced plasticity effect, the grating remains stable on the MAE surface for at least 90 hours while the magnetic field is maintained.

Upon removal of the field, the diffraction efficiency rapidly decays and vanishes within a few minutes. This effect is significantly more pronounced in MAE samples with a higher iron filler content (80 wt%) compared to those with lower content (70 wt%). A simple theoretical model is developed to describe the observed dependence of diffraction efficiency on the applied magnetic field. The results highlight the potential of MAEs as magnetically reconfigurable diffractive optical elements. Furthermore, the presented approach offers a convenient method for studying the micrometer-scale dynamics of magnetically induced plastic deformation in MAEs [1].

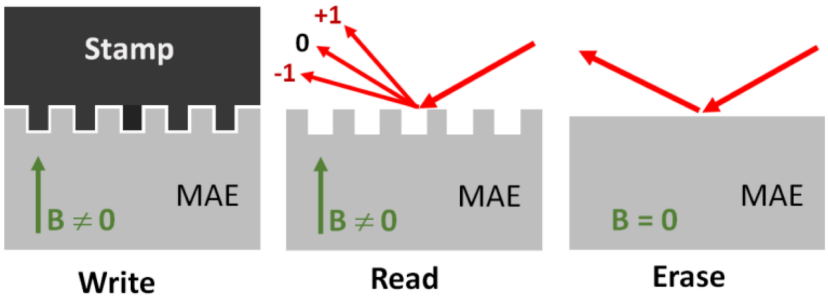


Figure 1: Schematic illustration of the write–read–erase process of an embossed surface optical grating.

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