ADVANCED FUNCTIONAL MATERIALS

Supporting Information

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Magnetomechanical Four-State Memory

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((Optional Dedication))

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Supporting Information

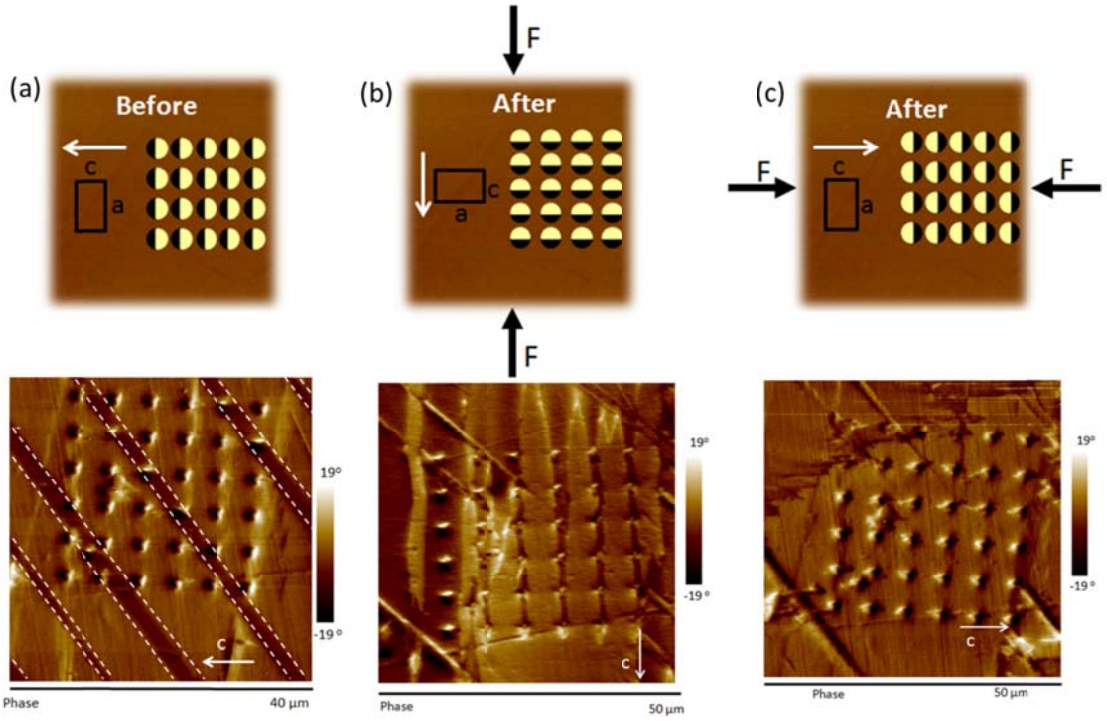

Figure S1. (a) Schematic and MFM phase images of an indentation array prior to applying a mechanical load. The crystallographic *c* direction is parallel to the sample surface and aligned horizontally. (b) A stress of 10 MPa was applied orthogonal to the *c*-axis shown in (a) inducing twin boundary motion and a 90^{o} switch of the magnetic stray field. The phase image shows the magnetic stray field as well as 180^{o}domain walls. (c) An 8 MPa stress was applied orthogonal to the *c*-axis (b) resulting in the 90^{o} switch of the dark/bright contrast. In (a), isolated twins (bounded by the dashed lines) provide a means to switch the direction of the magnetic stray field for a small number of indentations.

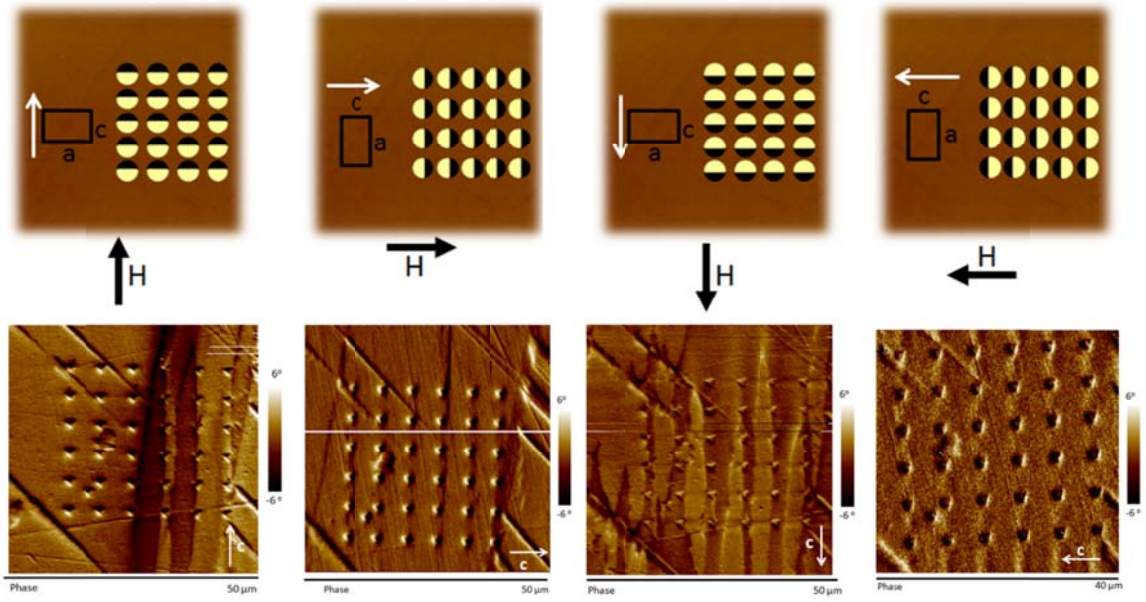

Figure S2. Schematic and MFM phase images of an indentation array after exposure to a 2 T magnetic field applied in four different orientations. After each application of the magnetic field, the indentation arrays were imaged with AFM/MFM. The switch of the magnetic stray field with the direction of the applied magnetic field demonstrates the four possible magnetic memory states.

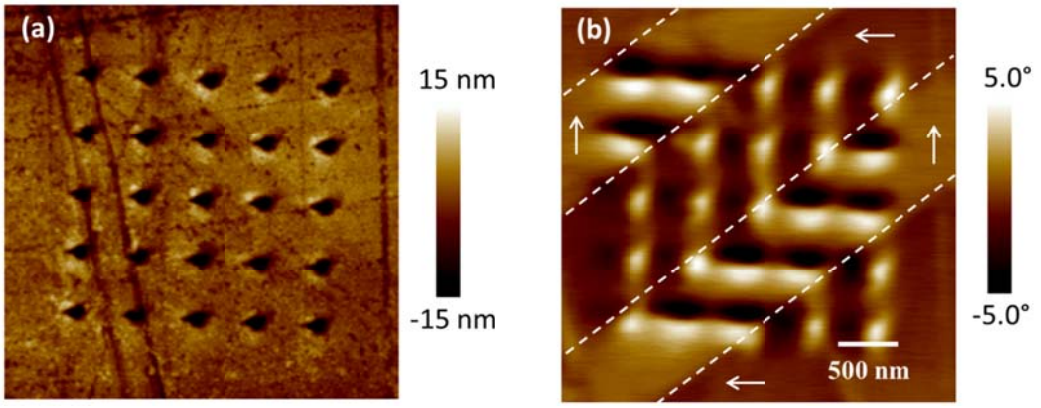

Figure S3. (a) AFM topography image of a 5 x 5 indentation array and corresponding (b) MFM phase image shows twin boundaries (white dashed lines). As indentations cross the twin boundaries, the local magnetic stray field switches 90^{o}. The scale bar in (b) applies to both images.