ADVANCED MATERIALS

Supporting Information

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Direct Transfer of Magnetic Sensor Devices to Elastomeric Supports for Stretchable Electronics

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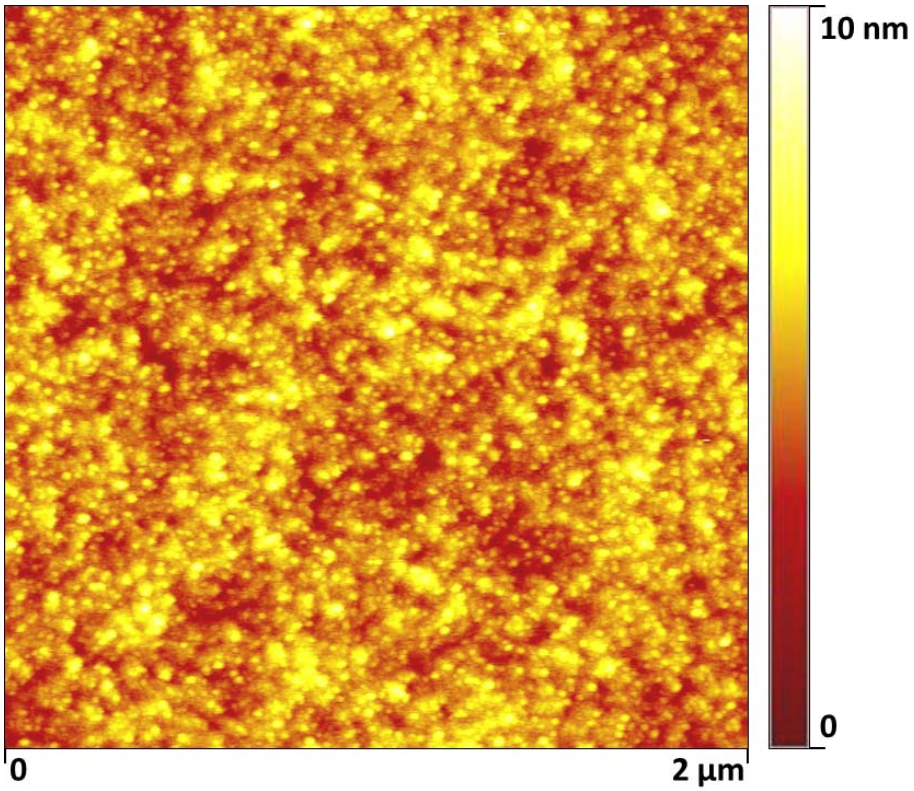

Figure S1: AFM micrograph of the donor substrate surface with the PAA sacrificial layer. The roughness value of the displayed area is R_{RMS} = 0.8 nm.

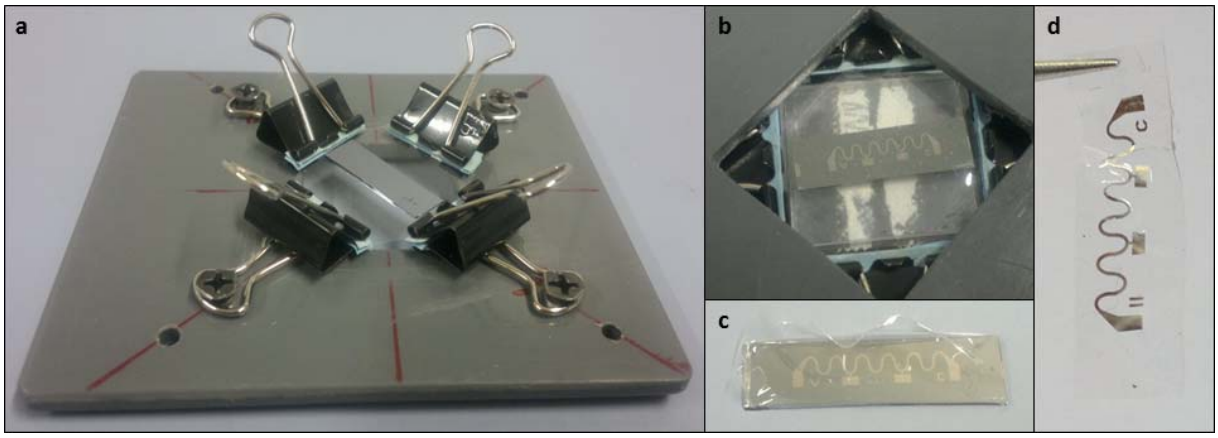

Figure S2: Transfer of a GMR meander element. (a) PDMS receiver substrate fixed to the holding frame for biaxial pre-stretching and donor substrate attached to its activated surface after the plasma treatment. (b) Structured magnetic nanomembrane between donor and receiver during the bonding step. (c) Stretched receiving substrate attached to the rigid donor substrate after bonding. (d) released PDMS membrane with transferred GMR multilayer meander.

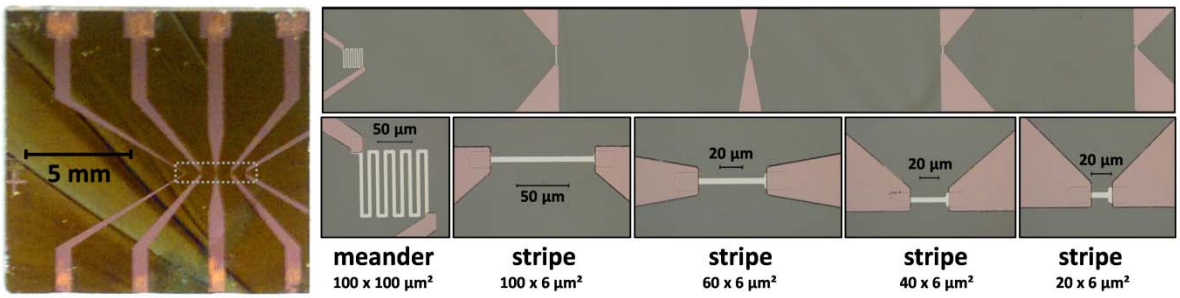

Figure S3: The GMR microsensor array. Entire structure on the donor substrate (left) electrode system and five differently shaped microsensors (right): one meander and four stripes of different length. The sensor width in all cases is 6 µm.

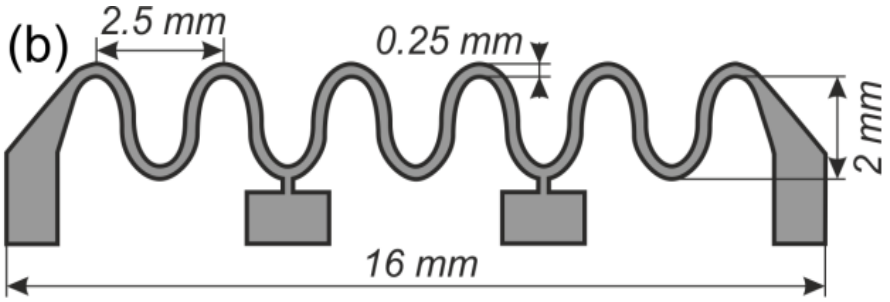

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Figure S4: Dimensioning of the serpentine meander structure used for stretchable $[Co/Cu]_{50}$ GMR multilayer elements.

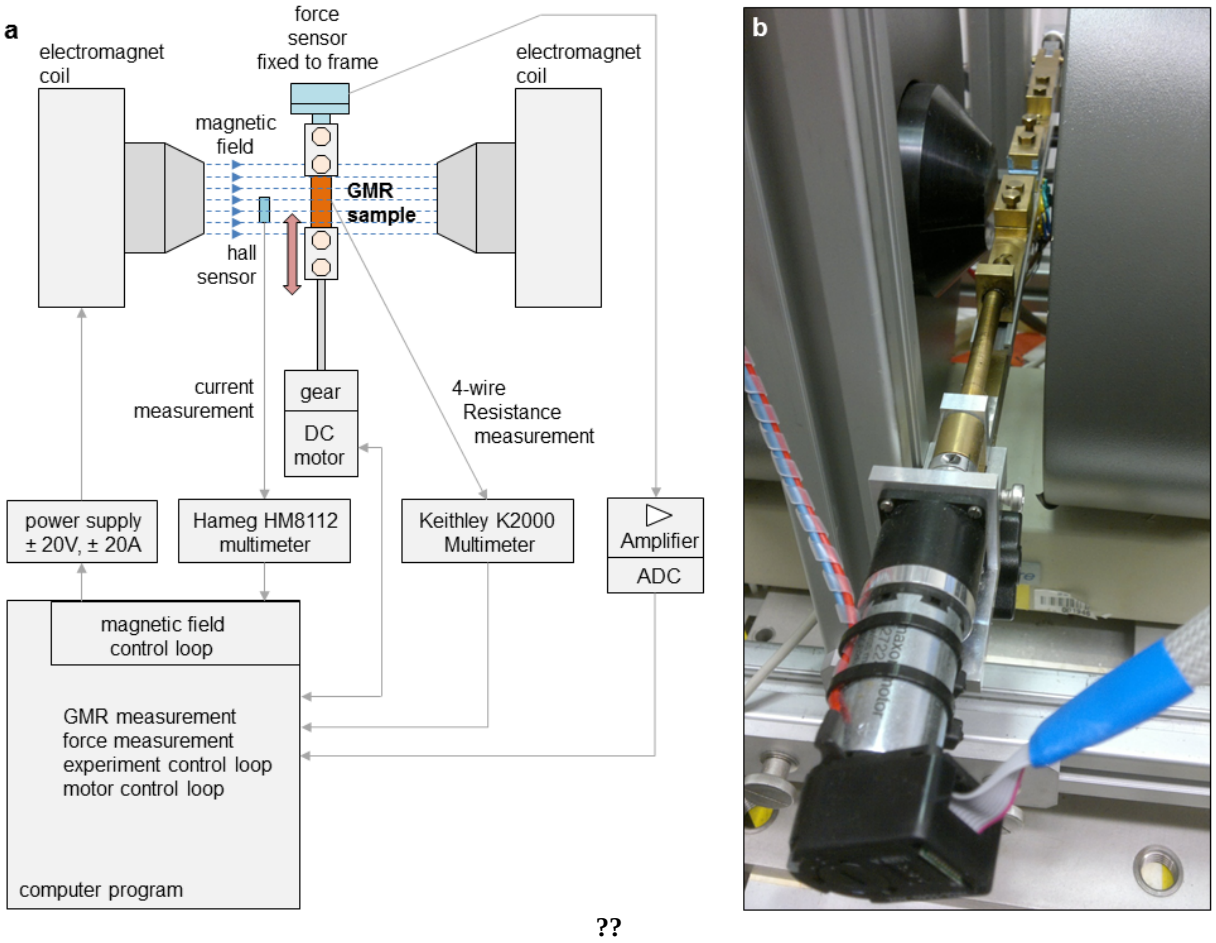

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Figure S5: The in-situ GMR stretching setup. (a) Schematic view of the setup. (b) Photograph of the motorized stretching stage between the pole shoes of the electromagnet. A close up of a contacted sample between the clamps can be found in the inset of figure 3b.

Supporting note: Approximation of mechanical parameters of the GMR film.

Literature values of the Young's module E and Poisson's ratio ν for the three materials in the $[Co/Cu]_{50}$ GMR layer including the 4 nm plasma oxidized silicon layer can be found to be E_{Co} = 211 GPa, ν_{Co} = 0.31, E_{Cu} = 131 GPa, ν_{Co} = 0.33, E_{SiO2} = 73 GPa and ν_{SiO2} = 0.17. Weighted with the respective total layer thicknesses of t_{Co} = 51 nm, t_{Cu} = 60 nm and t_{SiO2} = 4 nm, this results in E_f = 164 GPa and ν_f = 0,32 used for the calculation of the wrinkling period (Equation 1).