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Electric field controlled strain induced reversible switching of magnetization in Galfenol nanomagnets delineated on PMN-PT substrate[1] HASNAIN AHMAD, Department of Electrical and Computer Engineering, Virginia Commonwealth University, JAYASIMHA ATULASIMHA, Department of Mechanical and Nuclear Engineering, Virginia Commonwealth University, SUPRIYO BANDYOPADHYAY, Department of Electrical and Computer Engineering, Virginia Commonwealth University — We report a *non-volatile* converse magneto-electric effect in elliptical Galfenol (FeGa) nanomagnets of ~300 nm lateral dimensions and ~10nm thickness delineated on a PMN-PT substrate. This effect can be harnessed for energy-efficient non-volatile memory. The nanomagnets are fabricated with e-beam lithography and sputtering. Their major axes are aligned parallel to the direction in which the substrate is poled and they are magnetized in this direction with a magnetic field. An electric field in the opposite direction generates compressive strain in the piezoelectric substrate which is partially transferred to the nanomagnets and rotates their magnetization away from the major axes to metastable orientations. There they remain after the field is removed, resulting in non-volatility. Reversing the electric field generates tensile strain which returns the magnetization to the original state. The two states can encode two binary bits which can be written using the correct voltage polarity, resulting in non-toggle behavior. Scaled memory fashioned on this effect can exhibit write energy dissipation of only ~2 aJ.

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Hasnain Ahmad
Department of Electrical and Computer Engineering, Virginia Commonwealth Univ

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