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Experiments on straintronic nanomagnetic logic with two-state elliptical and four-state diamond and concave magnetostrictive nanomagnets[1] NOEL D'SOUZA, MOHAMMAD SALEHI FASHAMI, SUPRIYO BANDYOPADHYAY, JAYASIMHA ATULASIMHA, Virginia Commonwealth University — Experimental work on strain-induced magnetization switching of single-domain magnetostrictive nanomagnets grown on a bulk <001>PMN-PT substrate is demonstrated through Magnetic Force Microscopy (MFM) studies. Low-moment MFM probes are used in order to minimize tip-induced magnetization switching of the nanomagnets. Voltages are applied along the length of the PMN-PT substrate (d_{33} mode) to generate the required strain in the magnetostrictive nanomagnet. Domain switching is then investigated in uniaxial (two-state) i) isolated, ii) dipole-coupled, and iii) an array of nanomagnets to implement NAND logic. Subsequent theoretical studies focus on four-state magnetostrictive nanomagnets (diamond- and concave-shaped). The magnetization characteristics of these shapes, particularly the switching coherence, are examined for various criteria (size, concavity depth, thickness, etc.) with the conclusion that concave nanomagnets are the ideal shape for coherent and reliable magnetization switching in future magnetoelectric devices. Experimental results of magnetic field- and stress-induced switching in these concave nanomagnets on a bulk PMN-PT substrate are also presented.

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