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Magneto-elastic properties of frustrated triangular magnetic structure: flexomagnetic effect RENAT SABIRIANOV, PAVEL LUKASHEV, University of Nebraska at Omaha — We report results of ab-initio calculations on the magneto-elastic properties of the Mn_3AN (A=Ga, Zn). We show that these materials exhibit rich array of magneto-elastic phenomena, i.e. change in magnetization due to the mechanical deformation of the crystal lattice, - linear piezomagnetic, non-linear magneto-elastic, and linear flexomagnetic effects. These effects are due to the complex symmetry which combines perovskite crystal and the frustrated triangular magnetic structures. We demonstrate from first-principles calculations of the Mn_3AN that the external strain gradient induces the magnetization in these systems and it depends linearly on the strain gradient. We applied a classical Heisenberg model to simulate the effect of the strain on the frustrated triangular lattice at zero temperature. We assume antiferromagnetic interactions between nearest neighbors. Using Monte Carlo simulation of the triangular lattice we observe the induction of magnetization upon application of strain gradient. Thus, we conclude that the mechanism behind flexomagnetism is the dependence of the exchange interaction on inter-atomic distances. In particular, when external strain gradient is applied these distances become inequivalent, which results in "out-of-plane" rotations of local magnetic moments and appearance of net magnetization. We estimate the flexomagnetic coefficient to be $\sim 2\mu_B$Å.

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