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Statics and dynamics of zero field stable skyrmions in magnetic thin layers NIKOLAI S. KISELEV, IAS1, Forschungszentrum Jülich, Germany, CHANGHOON HEO, IMM, Radboud University Nijmegen, Netherlands, ASHIS KUMAR NANDY, IAS1, Forschungszentrum Jülich, Germany, THEO RASING, IMM, Radboud University Nijmegen, Netherlands, STEFAN BLÜGEL, IAS1, PGI1, Forschungszentrum Jülich, Germany — We present a comprehensive theoretical study of the statics and dynamics of magnetic skyrmions stabilized in zero magnetic field. The essential energy contributions for the stability of such magnetic skyrmions are the Dzyaloshinskii-Moriya interaction (DMI) and the uniaxial anisotropy. We define a finite range of the strength of these parameters corresponding to the stability of isolated skyrmions at zero magnetic field. Within this range there are two metastable skyrmion solutions characterized by opposite polarity and opposite topological charge. Such skyrmions can lead to conceptually new approaches in data storage provided by field or current induced switching between two of such skyrmion states. We discuss in detail various aspects of the problem connected with the switching between two skyrmion states driven by an applied magnetic field pulse, including the role of magnetic pulse width, intensity and direction. The role of damping and dependencies on magnetic layer thickness, size and shape are also discussed. Presented results are obtained by the method of stochastic spin dynamics simulation applied to an extended Heisenberg model for localized magnetic spins.

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