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Flexible Magnetic Membranes[1] PABLO VAZQUEZ-MONTEJO, JOSHUA DEMPSTER, MYKOLA TASINKEVYCH, MONICA OLVERA DE LA CRUZ, Northwestern Univ — Flexible magnetic filaments can be synthesized by joining superparamagnetic beads with elastic linkers, giving rise to interesting phenomena due to the combinations of their elastic and magnetic properties, which have found diverse applications, such as micro-mechanical sensors and self-propelled swimmers. We present a theoretical study of their two-dimensional counterparts, i.e. membranes composed of linked paramagnetic beads. In our model, the conformations of these magnetic membranes are governed by the competition between the bending energy and the dipolar interactions of nearest neighbors induced by a precessing magnetic field. We exploit the symmetries of these energies to determine equilibrium configurations of open and closed magnetic membranes. We characterize these shapes in terms of the area and material parameters of the membrane, as well as of the strength and precession angle of the magnetic field. In particular, we show how depending on the precession angle open membranes may form either rippled or helicoidal surfaces, whereas closed membranes may elongate or flatten. These kind of membranes might be suitable for many potential applications due to their controllable conformational changes.

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