

Maria Ekiel-Jeżewska

Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw,  
Poland

**Knotted and unknotted flexible loops settling under gravity in a viscous fluid**

**Abstract:**

Dynamics of elastic, knotted loops settling under gravity in a viscous fluid are studied numerically and experimentally. The loops are modelled as chains of beads, with harmonic stretching and bending potential energies between the consecutive beads and the consecutive bonds linking the beads. The Reynolds number is assumed to be much smaller than unity and the fluid flow obeys the Stokes equations. Hydrodynamic interactions between all the beads are described by the Rotne-Prager mobility matrices. In most cases, the trefoil and other torus knots attain rather flat, toroidal-like, horizontal structures while settling. They perform a swirling motion and a slower rotation. The basic features of the motion and shapes, determined numerically, are also detected in the experiments with closed flexible ball-chains sedimenting in a very viscous silicon oil. The dynamics of knotted and unknotted flexible loops are shown to differ significantly from each other. The results have been published as: M. L. Ekiel-Jeżewska, M. Gruzziel, K. Thyagarajan, G. Dietler, A. Stasiak and P. Szymczak, *Phys. Rev. Lett.* 121, 127801 (2018) and M. Gruzziel-Słomka, P. Kondratiuk, P. Szymczak and M. L. Ekiel-Jeżewska, *Soft Matter* 15, 7262 (2019).