Electronic Supplementary Material (ESI) for Soft Matter.

Movie1: Periodic dynamics of two elastic trumbbells settling under gravity in a viscous fluid. Bending forces were evaluated with harmonic potential. Gravity-to-bending parameter $B' = 65$ and bead radius $a = l_0/8$, where l_0 is the equilibrium distance between centers of beads.

Movie2: Periodic dynamics of two elastic trumbbells, made of large beads, settling under gravity in a viscous fluid. Bending forces were evaluated with harmonic potential. Gravity-to-bending parameter $B' = 55$ and bead radius $a = l_0/2$.

Movie3: Comparison of dynamics obtained with harmonic and 'cosine' Kratky-Porod bending potentials for sedimenting elastic trumbbells with small beads. With harmonic potential periodic motions are observed, while Kratky-Porod potential results in spurious, oscillatory and repulsive dynamics. Gravity-to-bending parameter $B' = 75$ and bead radius $a = l_0/8$.

Movie4: Comparison of dynamics obtained with harmonic and 'cosine' Kratky-Porod bending potentials for sedimenting elastic trumbbells with large beads. With Kratky-Porod bending potential non-physical results with large overlaps of the beads are obtained, while harmonic potential leads to periodic dynamics. Gravity-to-bending parameter $B' = 65$ and bead radius $a = l_0/2$.

Movie5: Comparison of dynamics of sedimenting elastic trumbbells (with $B' = 110$ and small beads with radii $a = l_0/8$), obtained with harmonic bending potential and a modified 'cosine' KP potential $U_b = A/l_0[(1 - cos\beta) + 1/6(1 - cos\beta)^2]$. With harmonic bending potential, after long relaxation time, periodic motions are observed. Modified 'cosine' KP potential results in spurious, oscillatory and repulsive dynamics, in a similar way as for the 'cosine' KP potential. The difference is that now the threshold for spurious dynamics is shifted to larger values of B'.