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INTERPLAY OF INERTIA AND DEFORMABILITY ON RHEOLOGICAL PROPERTIES OF A SUSPENSION OF CAPSULES

Timm Krueger[*,1], **Badr Kaoui**[2] **and Jens Harting**[3]

[1] School of Engineering, University of Edinburgh, The King's Buildings, Mayfield Road, EH9 3JL Edinburgh, United Kingdom, timm.krueger@ed.ac.uk, `www.timm-krueger.de`
[2] Physikalisches Institut, Universität Bayreuth, Theoretische Physik I, 95440 Bayreuth, Germany, badr.kaoui@uni-bayreuth.de, `www.tp1.physik.uni-bayreuth.de/de/team/3_postdoc/Kaoui-Badr`
[3] Department of Applied Physics, Eindhoven University of Technology, P. O. Box 513, 5600 MB Eindhoven, The Netherlands, j.d.r.harting@tue.nl, `www.tue.nl/en/employee/ep/e/d/ep-uid/20097255`

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The interplay of inertia and deformability has a substantial impact on the transport of soft particles suspended in a fluid. However, to date a thorough understanding of these systems is still missing and only a limited number of experimental and theoretical studies is available. We combine the finite-element, immersed-boundary and lattice-Boltzmann methods to simulate three-dimensional suspensions of soft particles subjected to planar Poiseuille flow at finite Reynolds numbers. Our findings confirm that the particle deformation and inclination increase when inertia is present. We observe that the Segré-Silberberg effect is unstable with respect to the particle deformability. Depending on the deformability and strength of inertial effects, inward or outward lateral migration of the particles takes place. In particular, for increasing Reynolds numbers and strongly deformable particles, distinct flow focusing emerges which is accompanied by a non-monotonic behaviour of the apparent suspension viscosity and thickness of the particle-free layer close to the channel walls.

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