COST Action MP1305
"Flowing Matter"

Helmholtz-Institut Erlangen-Nürnberg
Complex Fluids and Interfaces Group

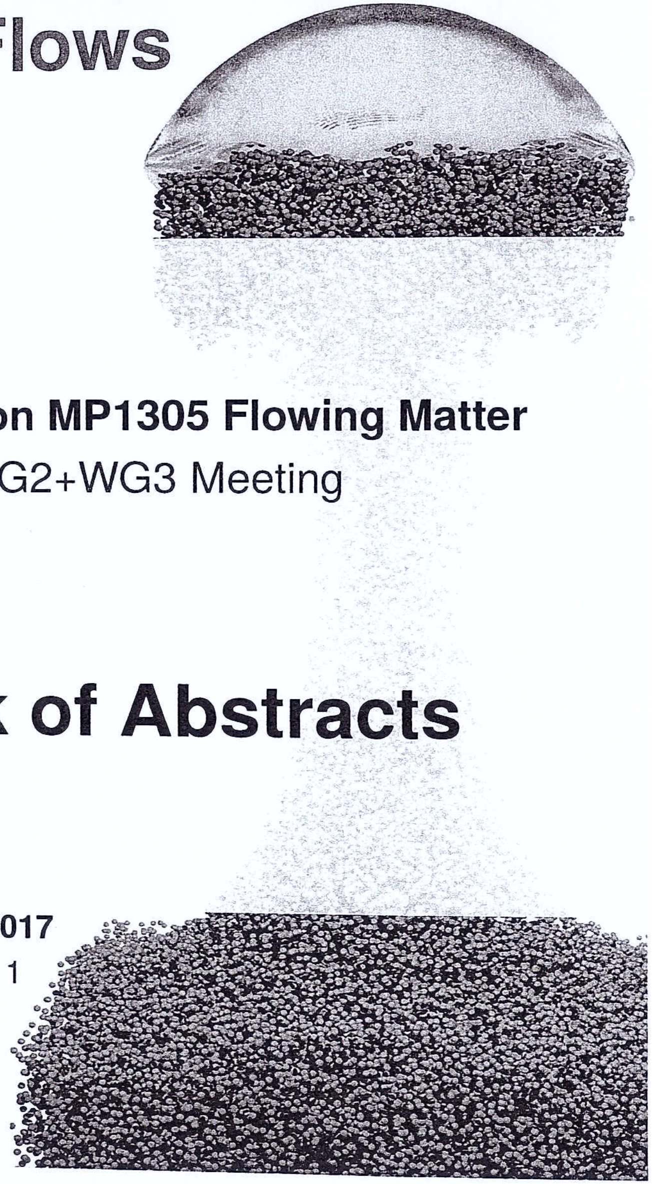
Cluster of Excellence
Engineering of Advanced Materials

Dynamics of Interfaces in Complex Fluids and Complex Flows

COST Action MP1305 Flowing Matter *WG2+WG3 Meeting*

ERLANGEN 2017

Dynamics of Interfaces in Complex Fluids and Complex Flows



COST Action MP1305 Flowing Matter

WG2+WG3 Meeting

Book of Abstracts

28 February - 3 March 2017

Kreuz+Quer, Bohlenplatz 1

Erlangen, Germany

Organisation

The workshop is organized under the umbrella of the COST Action MP1305 Flowing Matter by the Helmholtz Institute Erlangen-Nürnberg for Renewable Energy.

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Program

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Brownian motion of colloidal particles with arbitrary shapes

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Within microhydrodynamics, based on solutions of the Stokes equations, it is possible to determine the relation between the conformation of nano or microparticles and the system parameters which can be measured - such as e.g. the hydrodynamic radius. However, derivation of such relations is often challenging, because it requires solving conceptual problems. For example, are the mean square displacements of different particle points the same? While evaluating the self-diffusion coefficient of a non-symmetric particle, and averaging its mobility, which reference point should be chosen? In Ref. [1], this problem has been solved, and in Ref. [2], the results have been applied to evaluate numerically the hydrodynamic radius of fibrinogen at different conformations and compare with the corresponding experimental data.

The characteristic time scales of the translational and rotational Brownian diffusion for nanoparticles are typically much smaller than time resolution of the experiments. In this case, nanoparticles can be treated as point-like, and described by the standard Brownian theory. However, for microparticles, the characteristic Brownian time scales are of the order of seconds, and therefore non-negligible in comparison to the typical time scales of the measured Brownian motion. For microparticles of complex shapes, a more general theoretical approach is needed. The exact analytical expressions for the time-dependent cross-correlations of the translational and rotational Brownian displacements of a particle with arbitrary shape have been recently derived [3, 4], and it has been demonstrated how to benefit from these results while analyzing experimental data [5].

References

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