

CEMRACS '08

Modelling and Numerical Simulation of Complex Fluids
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Simulation of red blood cells aggregation

Project proposed by

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This project aims at investigating the individual and collective behaviour of red cells, in the context of granular flow modeling. Red cells are modelled as assemblies of spheres (about 10) in interaction, according to some two- and three- body forces to ensure geometrical and structural suitability. It is based on a numerical tool, SCOPI, developed by the Laboratoire de Mathématiques d'Orsay.

We focus on some specific structures that can be observed experimentally.

Aggregation of red cells can be reproduced by prescribing short range interaction forces between those assemblies. The following tasks remain to be done :

- tuning of cohesion forces to reproduce the structural properties of red cells as they are described in the literature ;
- elaboration of forces between RBC's to reproduce the rouleaux formation and breaking which are observed experimentally ;
- lateral migration of RBC's leading to inhomogeneous radial distributions of particles in tube flows should be taken into account in the numerical simulations ;
- the possibility to simulate red cells flows in a torus in order to study in a rigorous way the long-time asymptotic behaviour of aggregates.

This project is part of the ANR project MOSICOB : "Modélisation et simulation de fluides complexes biomimétiques" involving LSP (GRENOBLE), Laboratoire de Mathématiques (ORSAY) and Institut Elie Cartan (NANCY).