**Laboratoire PPSM – UMR CNRS 8531**

Photochimie et Photophysique Supramoléculaires et Macromoléculaires

# Séminaire PPSM

**Mercrdi 13 novembre 2019 - 11h00**

**Auditorium D. Chemla - Bâtiment IDA**

## Professeur Ruri HIDEMA

Department of Chemical Science and Engineering, Kobe University, Japon

Invité par : Robert Pansu

# «Effects of polymer characteristics and conformation on complex flow behavior of polymer solution»

The seminar related to dilute solution rheology and microfluidics will be composed of two parts.

The first part is the observation of sodium hyaluronate (Hyaluronic Acid Sodium salt, Na-HA) solution in planar abrupt contraction-expansion microchannels to discuss the effects of polymer flexibility and entanglement on elastic instability. As the rigidity of Na-HA depends on the ionic strength of a solvent, Na-HA was dissolved in water and phosphate buffered saline. The flow regimes of the Na-HA solutions in several planar abrupt contraction-expansion channels were characterized by rheological properties of the solution. It was found that the entanglement of Na-HA in the solution is a more dominant factor affecting the flow regimes than the solution relaxation time and polymer rigidity [1].

The second part of the seminar is measurements of drag force due to synthetic polymers in flowing fluids by using a scanning probe microscope (SPM). Methoxy polyethyleneglycol thiol (mPEG-SH) was attached to the cantilever probe of the SPM, which was further immersed in flows of glycerol and polyethyleneglycol (PEG) solutions. The mPEG-SH-bonded cantilever detects the extra force due to polymer-polymer and polymer-fluids interaction in flowing fluids. The conformation of the mPEG-SH polymer bonded to the probe of the cantilever was predicted, and the drag force due to the deformed mPEG-SH was calculated. The forces detected by experiments using the SPM and the forces obtained by model calculations were compared, and found to be reasonably close [2].

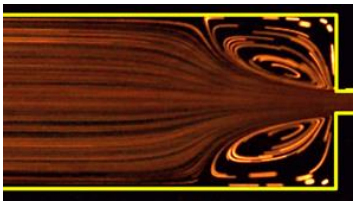

Fig.1. Entry flow of Na-HA PBS solution in in the upper stream region of a planar abrupt contraction-expansion microchannel.

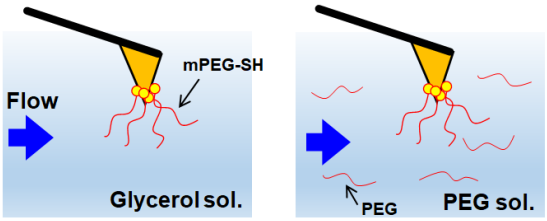


Fig.2. Schematic of mPEG-SH-bonded cantilevers in flows of glycerol or PEG solution.

[1] Ruri Hidema et al., *Physics of Fluids*, 31, 072005 (2019)
[2] Ruri Hidema et al., *Physical Review Fluids*, 4, 074201 (2019)

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