Experiments in Fluid Mechanics 2015

Warsaw, 26-27.10.2015

Institute of Aeronautics and Applied Mechanics

Nowowiejska 24, 00-665 Warsaw, Poland

Title of presentation:
Mobility of nanofilaments

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Abstract:
Study of flexibility of biomolecules and polymers is the basis to determine their structure and dynamics. Observing the dynamics of the elastic objects suspended in fluid permits the evaluation of the mechanical properties responsible for their complex behaviors (e.g. folding of DNA). Dynamics of highly deformable suspensions of nano-objects is also fundamental for the understanding and prediction of the rheological properties of typical biological fluids (cytoplasm, plasma).

At molecular scale, due to limitations of a very small length and time scales, it is very difficult (or impossible) to find answers to basic questions about the potential effects of interactions or complex hydrodynamic behavior of long biological molecules suspended in fluid. We propose a microscale experimental model in form of highly deformable nanofilaments, which permits for precise optical measurements and to evaluate hydrodynamic interactions (mobility) [1]. The conducted research include determination of the mechanical properties of elastic hydrogel nanofilaments produced by electrospinning that can serve as experimental benchmark to validate theoretical and numerical models describing dynamics of long biological molecules (e.g. proteins, DNA). Nanofilaments mechanical properties are determined by studying their dynamic bending in shear flow and deformations due to the thermal fluctuations (Brownian motion). These results are compared with AFM nanoindentation measurements.

Data obtained from this research project will be a base to create biocompatible nano-objects that can become tools for the regeneration of tissue (e.g. neural tissue).

[1] Nakielski, P., Pawlowska, S., Pierini, F., Liwinska, V., Hejduk, P., Zembrzycki, K., E. Zabost, E., Kowalewski, T.A., PLOS ONE 5,10(6), 2015.

Project supported by NCN grant no. 2011/03/B/ST8/05481.