Micro-rheometer for Newtonian and non-Newtonian fluids

Executive summary

Researchers from the University of Barcelona and the Centre for Mathematical Research have developed an innovative technology for measuring the viscosity of Newtonian and non-Newtonian fluids. The exclusive features of this invention meet an established need in industry for viscosity measurement of biological samples with a portable, fast, accurate, and easy-to-use technology.

Introduction

Several diseases associated to blood disorders such as leukaemia, polycythemia, anaemia, etc. alter the rheological properties of blood, in particular its viscosity. The development of small and portable micro-rheometers capable to measure the rheological properties of small sample volumes in a short time that might help in early diagnosis of these conditions is highly needed.

In addition, most of the existing rheometers in the market are suitable for the measurement of either Newtonian or non-Newtonian fluids, but not for both kinds of fluids. Moreover, limitations of conventional macroscopic rheometers by a minimum torque value restrict viscosity measurements to a minimum shear rate value. Consequently, in order to get a valid viscosity result, measurements at higher shears have to be performed.

Description

The present invention proposes a new method and technique to develop an economical, easy-to-use and portable bio micro-rheometer that is able to operate in a wide range of shear rates and to analyse any fluid with different viscosity values. The operating pressures ranges from 0.5 to 250 KPa, although even higher pressures are possible at higher shear rates.

Advantages

- Very small sample volume (~ 1 μl).
- Excellent performance even at low shear rates (< 4 s⁻¹).
- High sensitivity (variations of viscosity of 0.02 mPa·s are measured with 5% error).
- Wide range of pressure (0.5 to 250 KPa).
- No damage of biological samples.
- No need for optical elements (high speed camera or microscope).

Current stage of development

A prototype has been manufactured and tested for Newtonian and non-Newtonian fluids.

Goal

Industrial partners are sought to further develop the technology through a co-development and license agreement.

Patent


Reference

AVCRI251

Contact

Dr. Eva Martín Fierro
Email: emartin@fbg.ub.edu, Tel: +34 934 037 257

Mr. Guillem Pérez Sánchez
Email: gperez@crm.cat, Tel : +34 935 812 953