

Nanofluidic System

Background

The study of in-liquid samples using microscopy (electron and optical) requires the implementation of nanofluidics, very sensitive equipment that is able to manipulate the fluid in a very precise manner. The main current problem in nanofluidics is to truly achieve liquid flow in the viewing area of the chip. Having control on the liquid flow, and up to some extent on liquid layer thickness, is essential to achieve repeatability and high resolution in electron and optical microscopy experiments. Moreover, in cases when liquid mixing, stop flow, and electrochemical capabilities are needed true liquid flow becomes a must; it is certainly crucial to succeed with time-resolved optical and electron scattering experiments.

There currently is a need for a complete Nanofluidic System optimized for controlled “true” high-flow (high throughput of in-liquid samples) for high resolution electron and optical microscopy studies.

Description of the invention

This Nanofluidic System includes:

- i) a liquid pumping station that provides no pressure fluctuation and an outlet pressure of only about 20 Torr (being 760 Torr the usual value)
- ii) a complete “modular” nanofluidic cell holder that can be fully disassembled for replacement of parts (nanofluidic cells, tubing and electrical connections).
- iii) The Nanofluidic Chips have been optimized to allow for a variety of experiments that require high liquid flow (e.g. fast mixing or fast stop flow conditions) with minimal window deformation and electron/optical beam pathlengths down to 50 nm (variable within 50 nm to 100 µm depending on the application).

Advantages

This technology allows for the study of nanofluids under various flow conditions, with minimal or no pressure shockwaves to disturb the fluid flow, and no distortion of the viewing window.

This enables for better, previously unattainable conditions under which the nanofluid may be studied, all without inducing the unwanted variables of distortion to the viewing window or fluid flow.

It also has a custom Nanofluidic Chip holder that greatly improves ease of use.

Potential applications

Nanofluidic microscopy (electron and optical) with:

- Actual fluid flow through the Nanofluidic Chip itself;
- A means to control the fluid flow without inducing pressure shockwaves in the fluid itself;
- A non distorting viewing window on the Nanofluidic Chip; and
- A special Nanofluidic Chip holder to improve ease of use.

Reference

UW # 10132

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Patent status

US patent application filed

Stage of development

Prototype
Ongoing research

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