TECHNOLOGY

Micro-Fluidic Pumping

OVERVIEW

It is known in the art that most solid surfaces acquire a surface electric charge when brought into contact with a polar liquid. The surface charging mechanisms include, for example, ionization, ion adsorption and ion dissolution. These mechanisms occur naturally, and their strength depends on the solid and liquid materials, as well as the surface preparation. The surface charge attracts counterions to the solid/liquid interface, thus creating a nanometer thin "Debye" electric double-layer. When an electric field is applied through the liquid, the ions in the Debye layer migrate in the field, dragging the remainder of the fluid with them by means of viscous forces. This effect is referred to as electroosmosis, or EOF pumping, and is a phenomenon that is well known in the art for transporting liquids.

The present invention exploits the above phenomena. An actuation apparatus and a method utilizing electroosmotic pumping for generating stresses and strains that are capable of exceeding those generated by conventional actuators is proposed. The actuator is applicable in a variety of fields, such as mechanics, aerodynamics, etc., and a host of additional fields that utilize stress and/or strain actuators and an actuation apparatus and method which is robust in design and is relatively simple and economical to manufacture and implement.

Generally, the present invention provides an actuator cell and an actuator plate utilizing that can exhibit both large stresses in the tens of mega-Pascals and large strains of 30% or more, by embedding micro-fluidic networks consisting of channels and expanding chambers and compliant electrodes inside bonded layers of flexible material.

A U.S. patent application is pending.

For licensing information please contact the Office of Technology Commercialization, 301 405 3947 or by e-mail otc@umd.edu.

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Additional Information

INSTITUTION

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Microfluidics

EXTERNAL RESOURCES

- US Patent 7,523,608

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