University at Buffalo
Department of Civil, Structural and Environmental Engineering
School of Engineering and Applied Sciences

ENGINEERING SEMINAR

Capillary forces in patch clamping: creep under the action of pressure, adhesion, and voltage

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Abstract

The patch clamp technique allows manipulating a lipid bilayer via various forces – pressure, voltage and adhesion can set the patch into motion. The patch creep rate is controlled by the balance between the driving force and the friction. The creep velocity carries valuable information about the mechanism of motion, the state of the membrane, its interactions with the pipette, its charge etc. Negative pressure can be used to compensate the adhesion force until the patch is immobilized. This allows the adhesion energy of the bilayer to the glass to be measured through its pressure equivalent. Similarly, pressure compensation of the voltage-induced creep can be used to investigate the electric properties of the membrane.

References:

R.I. Slavchov, T. Nomura, B. Martinac, M. Sokabe, F. Sachs. Gigaseal mechanics: creep of the gigaseal under the action of pressure, adhesion and voltage. *J. Phys. Chem. B* **118** (2014) 12660.

Y. Nakayama, R.I. Slavchov, N. Bavi, B. Martinac. The energy of liposome patch adhesion to the pipette glass determined by confocal fluorescence microscopy. *J. Phys. Chem. Lett.* **7** (2016) 4530.

Biography

Radomir Slavchov is currently a Research fellow of the BP-International Centre of Advanced Materials, working in the Department of Chemical Engineering & Biotechnology, Cambridge University, UK, on problems related to fuels and adsorption processes in engines. He was previously teaching Colloid science in the Department of Physical Chemistry, Sofia University, Bulgaria, where he had his PhD on electrostatic phenomena in heterogeneous lipid monolayers. He is researching into the theory of adsorption at liquid interfaces; wetting, capillarity, biomechanics; electric properties of surfaces; and chemical physics of non-polar solutions.

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