Visco-Poroelastic Ionic Pump for Mechano-Selective Electronic Skin

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With the development of soft electronics, many studies on electronic skins (E-skins) have tried to emulate sensing capabilities of human skin including various mechanical stimuli such as pressure, strain, and torsion. However, previous reports still suffer from the ability to distinguish and recognize two or more mechanical stimuli including pressure, strain, and torsion.

To overcome this limitation, we describe E-skin recognizing two mechanical stimuli such as pressure, strain using visco-poroelastic behavior of ionic pump. The visco-poroelastic behavior of ionic pump have not only the viscoelastic behavior by the polymer matrix deformation, but also the poroelastic behavior due to diffusion of the ions inside the polymer matrix. As a result, our E-skin based on ionic pump is capacitive mechanical sensors of vertical and coplanar structure. These can distinguish pressure and strain when the direction of ion movement is identical with the mechanical stimuli.