Hydrogen bond-triggered mechanotransduction in synthetic multicellular ion pump

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We describe an novel concept of close emulation of biological cell membrane structures, through rational designing of a synthetic multicellular hybrid ion pump, composed of hydrogen-bond-co-coulombically confined [$EMIM^+$][$TFSI^-$] ion pairs on the surface of silica microstructures (artificial mechanoreceptor cells) embedded into a thermoplastic polyurethane elastomeric matrix (artificial extracellular matrix), to fabricate ultrasensitive artificial mechanoreceptor skin. Our artificial mechanoreceptors engage in reversible pumping of ionic fluids which are able to be formed EDLs (electric double layers) under external stimulus, that allowed us to fabricate ultrasensitive artificial skins (48.1–5.77 kPa^{-1}) over a wide range of pressures (0–135 kPa) at an ultra-low operating voltage of 1 mV. We also demonstrate a fully wearable drone controller by integrating our artificial skin sensor array and flexible wireless communication PCB (printed circuit board) that enable simultaneous and selective control of aerial drones.