Artificial Sensor Skin with Mechanosensitive Ion Nanochannels

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Creating artificial skin that shows the tactile-sensing capability of human skin has been a big challenge in tactile sensor research.

In this talk, inspired by the sophisticated physiological tactile sensing mechanism of human skin, we created an ultrasensitive artificial sensor skin with ion nanochannels based on visco-poroelastic biocompatible polymers, in which we directly addressed the sophisticated physiological tactile sensing mechanism of mammalian skin. To this end, we emulated the Piezo2 ionic mechanotransduction protein channel with a piezocapacitive ionic mechanosensory system that engages in ion squeezing when the polymer matrix is deformed under a mechanical non-equilibrium state. The artificial sensor skin is unprecedented in its ability to sustain a high sensitivity over a broad range of pressure (20nF kPa^{-1} at 0-30kPa) with reproducible operation at an ultralow-voltage (1mV). We also described that this new artificial human skin allows for voice identification, health monitoring, daily pressure measurements and even measurements of a heavy weight beyond capabilities of human skin.