Energy-Autonomous Electronic Skin

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Tactile or electronic skin is critical for haptic perception in robots, prosthetics, as well as, wearable electronics. The energy autonomy of skin in these applications is a needed as to enable portability and longer operation times. In this direction, we have recently obtained novel energy-autonomous flexible and tactile skin and this will be the focus of this talk. The tactile skin consists of graphene based a transparent touch sensitive layer integrated on top of a photovoltaic cell. The transparency of the touch sensitive layer is a key feature which allows photovoltaic cell to harvest energy using the light. The touch sensitive layer consumes ultra-low power (20 nW/cm^2) and this means the photovoltaic area required to drive the tactile skin is not too large. In addition to its energy autonomy, the fabricated skin is sensitive to touch, mainly due to a transparent polymeric protective layer spin-coated on the sensor's active area makes the co-planar capacitor sensitive to touch, detecting minimum pressures of 0.11 kPa with a uniform sensitivity of 4.3 Pa^{-1} along a broad pressure range. Finally, the tactile skin patches were integrated on a prosthetic hand, being the response of sensors for static and dynamic stimulus evaluated by performing tasks ranging from simple touching to grabbing of soft objects.