Crystalline PEDOT:PSS-Based Bioelectronic Interfaces

윤명한†
지스트
(mhyoon@gist.ac.kr†)

In this research, we investigated the crystalline poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS)-based on mixed conductors for bioelectronic applications. In particular, we studied the correlation among polymer film microstructure/composition, electrochemical performance, and underwater stability. Compared with the conventional PEDOT:PSS film, the highly-organized film microstructure in Crys-P lead to remarkable organic electrochemical transistor (OECT) characteristics such as large transconductance (>20 mS), low contact resistance (<1 W/cm), and extraordinary volumetric capacitance (113 F cm^{-2}). Simultaneously, minimal styrene sulfonate residues in the Crys-P film substantially attenuated the film swelling and afforded the robust OECT stability even after >20-day water immersion, >2000-time repeated on-off switching, or high-temperature/pressure sterilization. We expect that the present study will contribute to the in-depth understanding of the material microstructure/composition effect on channel-electrolyte interfaces and mixed ion-hole/electron transport, and the future development of implantable bioelectronics targeting at prolonged neural recording/stimulation.