Ultra-Flexible Electronics Interfacing Living Body

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Integration of flexible electronics into the living system is expected for advancing medical diagnostics and therapeutics. Such devices should be seamlessly conformed to the physical and mechanical environment of living body, in which acquired biosignals are expected to be transmitted wirelessly to external device. In this regard, we envisage the development of ultra-flexible electronics for wearable and implantable applications based on polymer nanosheet technology. The polymer nanosheet shows tens- to hundreds-of-nanometer thickness close to the scale of biomembranes [1], in which various types of polymers (e.g., biodegradable polymers, conductive polymers, and elastomers) are formed into the ultra-thin structure. Free-standing polymer nanosheets showed flexible and adhesive properties derived from their ultra-small flexural rigidity (< 10^{-2} nN m). In this talk, polymer nanosheet (or thin film)-based devices are introduced by combining polymer nanosheet and printing technologies with variety of unique inks [2] (Figure 1). The ultra-flexible device has been utilized as tissue-interfaced electronics to direct biosignals or functions in the design of ultra-conformable bioelectrodes for sports science [3] and plant biology [4], battery-free biosensors for glucose monitoring [5] and gas sensing [6], and implantable devices for photodynamic therapy [7] and hyperthermia therapy [8] in cancer treatment.

References

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Figures

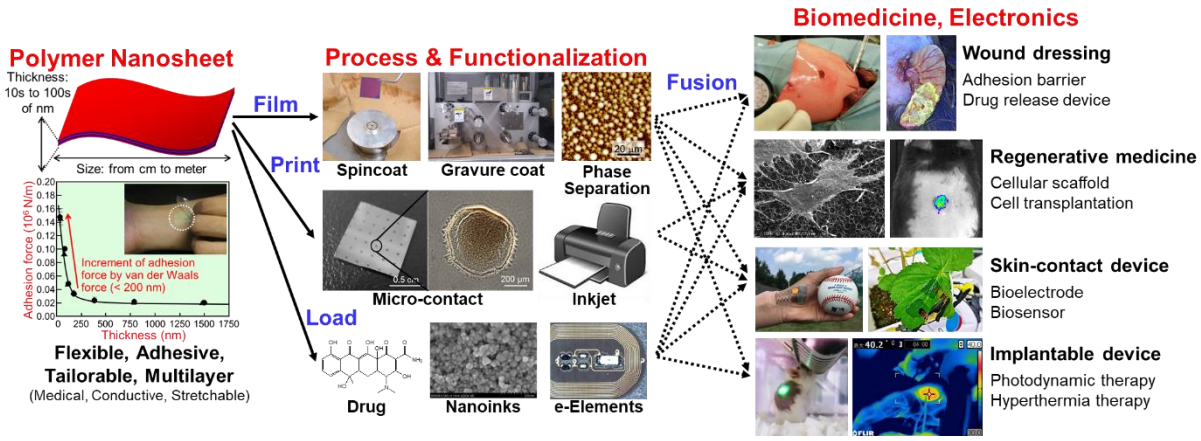

Figure 1: Ultra-flexible medical device based on polymer nanosheet technology