

pH Sensitive-Gelatin Hydrogel based Organic Electrochemical Transistors and their Integrated Logic Circuits

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Gelatin hydrogel is a natural polymer from hydrolysis of collagen, having great biocompatibility and biodegradability for biomedical research. Moreover, gelatin hydrogel has thermo-responsive characteristics making this hydrogel to be easily processed into a variety of shapes for a lot of applications, even electronic devices based on solution-process. Recently, hydrogel based electronics has been researched owing to interesting properties, because it is operated by interaction of ions attributing to low driving voltage. Especially, organic electrochemical transistor (OECT) is totally different from conventional field-effect devices in aspect of direct injection of ions into the active layer, usually PEDOT:PSS (Poly(3,4-ethylenedioxythiophene) polystyrene sulfonate). In this research, we suggest gelatin hydrogel as electrolyte and demonstrate OECT based on a sheet of gelatin. We modulate electrical characteristics of the OECT respect to pH condition of gelatin hydrogel from acid to base, and analyze its characteristics based on electrochemical theory, Nernst Equation. Moreover, we extend the gelatin based OECT to electrochemical logic circuits, for example, NOT, NOR and NAND gate.