Flexible Electronics for E-Skin Applications: Organic Electronics Utilizing Solvatochromic Mediums for Chemical Sensor Applications

Hwa Sung Lee

Department of Materials Science and Chemical Engineering, Hanyang University

E-mail: hslee78@hanyang.ac.kr / hwasung.l@gmail.com

Sensory feedback from external stimulus is critical for many tasks carried out by robots and humans, such as identifying objects or detecting hazards. Electronic skin (e-skin) is a crucial technology for these purposes. Artificial tactile skin that can play the roles of human skin remains a distant possibility because of hard issues in resilience, manufacturing, sensorics, electronics, energetics, and information processing due to the intrinsic problems of organic- or polymer-based materials. Taken together, these issues make it difficult to impart a robot or artifical sensory device with effective tactile skins. Nonetheless, progress over the past few years in relation with the above issues has been encouraging. Through various studies on sensory systems that can detect various external stimuli (pressure, strain, and chemical), we have variously reported the deformable sensors and flexible electronics, and through these, some of the skin functions were sucessfully simulated. In this study, we focus to present the results for chemical sensors by applying solvatochromic materials with twisted intramolecular charge-transfer (TICT) behavior depending on the polarity of the surrounding molecules, as an auxiliary NR sensing medium. The two chemical sensors to be introduced utilize organic field-effect transistor-based and capacitive structures, and effectively detect ammonia gas and lactic acid, respectively. These results are expected to contribute to the development of sensing media to improve the performance of chemical sensors and to bring some fresh ideas in this field in the future.