Abstract

Integrating materials of different characteristics to achieve complementary functionalities is a strong need for designing advanced applications of complex requirements. This presentation will demonstrate a unique approach of utilizing intermolecular interactions to accomplish not only the multifunctionality from combined materials but also their tailored properties for specific tasks. First, a multi-component electrolyte system using ionic liquids (ILs) and their mixtures will be discussed for seismic sensing applications in space missions at extremely low temperatures. The thermal and transport properties of such ILs-based mixtures are effectively modified with both aqueous and organic solvents by tailored molecular interactions over a broad temperature range. Second, an interpenetrating polymer network (IPN) system will be explored to develop an environmentally responsive hydrogel for applications in dynamic tactile displays. The formation of IPN structure not only significantly improves the mechanical properties of the synthesized hydrogel but also enables a positive swelling behavior favorable for sensory responses. The visible light responsiveness and additional mechanical enhancement of the hydrogel are also materialized by incorporating functional additives. The work serves as a new route of integrating materials to design multifunctional soft systems with desired properties beyond their original boundaries.