Intrinsically stretchable polymer conductors and semiconductors enabled by various molecular interactions

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Intrinsically stretchable polymer conductors and semiconductors, which are electrically conductive and malleable under mechanical strain without the aid of chemical additives and kirigami patterning, are key elements in polymer-based stretchable electronics. In this presentation, I will introduce our recent progress on intrinsically stretchable polymer conductors and semiconductors with electrical and mechanical properties improved by various molecular interactions.(*1–4*) Specifically, the electrical conductivity and stretchability of poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) were improved by employing *protic* ionic liquids due to favorable ion exchange and hydrogen bonding compared to aprotic ionic liquids. In addition, a semi-crystalline polymer semiconductor based on cyclopentadithiophene and fluorinated benzotriazole as electron donor and acceptor, respectively, showed simultaneously improved crystallinity, charge carrier mobility, and stretchability due to improved non-covalent interaction in edge-on crystallites formed by thermally-assisted structural phase transition. Our results demonstrate the importance of molecular interactions for improving stretchability of polymeric electronic materials for high-performance stretchable electronics.

References

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