세미나 초록

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발표 주제	Molecular Design of Polymer Semiconductors for Electronic and Energy Devices
발표 내용	Conjugated polymers have been widely studied as solution-processable organic semiconductors owing to their tunable electronic structures and compatibility with low-cost fabrication techniques. In most conventional designs, however, the side chains are chemically static and primarily serve to improve solubility and processability. This static nature inevitably imposes intrinsic trade-offs between processability, thermal stability, mechanical properties, and ionic/electronic transport, limiting the multifunctionality of conjugated polymer systems. In this presentation, we introduce a chemically transformable side-chain design strategy that decouples polymer processing from final material functionality. By incorporating side chains that undergo controlled chemical transformation after film formation, material properties can be dynamically reconfigured at different stages of processing and operation. We demonstrate that chemical cleavage–induced side-chain shortening leads to a pronounced increase in glass transition temperature and enhanced thermal stability. Furthermore, when polymer films are deposited on elastomeric substrates and subjected to thermal treatment, side-chain transformation induces spontaneous wrinkling structures, providing a simple and effective route to stretchable conjugated polymer films. In addition, chemical conversion of ester functionalities into carboxylic acids introduces efficient ion-transport capability, enabling the same polymer backbone to operate as an organic mixed ionic–electronic conductor (OMIEC). Overall, this work highlights chemically transformable side chains as an effective and versatile design strategy for overcoming long-standing trade-offs in conjugated polymers. By separating the requirements of processing and device operation, this approach opens new opportunities for multifunctional organic electronic materials.