

화학고 세미나

김영훈 교수
한양대학교 에너지공학과

Chirality in Semiconducting Materials for Circularly Polarized Light and Spin-Optoelectronics

In addition to the significant attention already focused on optoelectronics, which utilize the interconversion between light and electrons (e.g., photovoltaics and light-emitting diodes), chiral molecules offer additional functionality for semiconducting materials and devices. Firstly, chiral molecules can selectively control the spin angular momentum of light, enabling the absorption and emission of circularly polarized light. This property makes them highly applicable in encrypted optical communication and quantum computing. Secondly, chiral molecules can polarize charge carriers without requiring an external magnetic field, a phenomenon known as chiral-induced spin selectivity (CISS). Here, we present a strategy to incorporate chiral molecules into optoelectronic systems to control the direction of both light and charge carriers. To achieve this, we synthesized chiral organic/inorganic metal halide perovskites. In these materials, A-site chiral ammonium ions transfer chirality to inorganic metal halides through centro-asymmetric interactions. Through the CISS effect, we achieved a spin-injection selectivity of up to 80% and applied this to spin-polarized light-emitting diodes (spin-LEDs). In spin-LEDs, injected spin-polarized holes recombine with electrons of the correct spin direction, emitting light with matching polarization. This system achieved 2.6% circularly polarized electroluminescence at room temperature. Furthermore, we demonstrated circularly polarized light detectors based on chiral perovskites. These materials are anticipated to provide new avenues for advancing next-generation spin-optoelectronics.

Date : 2026년 5월 7일 (목) 오후 5시

Location : 과학관 B133호

Host : 연세대학교 화학과

