Chiral induced spin selectivity enabling a room temperature spin-LEDs

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In traditional opto-electronic approaches, control over spin, charge, and light requires the use of both electrical and magnetic fields. In a spin-polarized light-emitting diode (spin-LED), charges are injected and circularly polarized light is emitted from spin-polarized carrier pairs. Typically, injection of carriers occurs with the application of an electric field, while spin-polarization can be achieved using an applied magnetic field or polarized ferromagnetic contacts. Here we employ chiral induced spin selectivity (CISS) to produce spin-polarized carriers and demonstrate a spin-LED that operates at room temperature without magnetic fields or ferromagnetic contacts. The CISS layer consists of oriented self-assembled small chiral molecules within a layered organic/inorganic metal-halide hybrid semiconductor framework. The spin-LED achieves ± 2.6% circularly-polarized electroluminescence at room temperature. Thus, here we control of spin, charge, and light with only an applied electric field.