

CONDENSED MATTER SEMINAR

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Rashba effect and its signatures in hybrid organic-inorganic perovskites

Hybrid organic-inorganic perovskites (HOIPs), such as $\text{CH}_3\text{NH}_3\text{PbI}_3$, represent a revolutionary breakthrough for low-cost solar cells. To date, the photovoltaic efficiency has exceeded 22% in solar cells made of solution-processed HOIPs. HOIPs have also shown great promise in solid-state lighting and other optoelectronic applications. The extraordinary optoelectronic performance in HOIPs is due to a fortuitous combination of desired optical response and carrier dynamics.

A unique feature of the HOIPs is their colossal Rashba effect (RE), caused by strong spin-orbit coupling associated with the heavy atoms and the lack of inversion symmetry in their crystal structures. The RE breaks spin degeneracy in the conduction and valence bands, and has been extensively studied in the context of spintronics.

In this talk, I will show that the colossal RE can manifest itself in carrier transport, electron-hole recombination, linear and nonlinear optical absorption, and exciton spin dynamics of HOIPs and is a key to understanding these important optoelectronic properties. These manifestations can also be exploited to quantifying the RE in HOIPs.

Tuesday, September 12
4:00 pm
Room 334 JFB