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第234回 ISIT有機光エレクトロニクス研究特別室セミナー
第301回 未来化学創造センターセミナー



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「Engineering Perovskite Photophysics with Electroactive Organics」

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Hybrid organic-inorganic lead-halide perovskites have attracted significant interest for their applications in optoelectronics, ranging from light-emitting diodes to photovoltaics and X-ray detectors. Due to the inert nature of most organic molecules, the inorganic sublattice generally dominates the electronic structure and therefore optoelectronic properties of perovskites. Similarly, layered (2D) perovskites traditionally incorporate bulky organic molecules exerting primarily a structural role by acting as an electronically insulating spacer. To explore novel functionalities of 2D perovskites, we use optically and electronically active organic spacers, such as the carbazole-based Cz-Ci spacer where Ci indicates the alkyl chain length. In this talk, I will discuss how the incorporation of this conjugated π -core drastically changes the photophysics of 2D perovskites through an enhanced electronic coupling between the inorganic lead-halide and organic layers. I will present spectroscopic evidence of photoinduced interlayer charge transfer through ultrafast transient absorption spectroscopy. Furthermore, we have demonstrated how the interlayer electronic coupling can be tuned by varying the interlayer distance through Ci, resulting in an intriguing sub-gap charge transfer state in (Cz-C3)2PbI4. Finally, this enhanced coupling translates to larger distances as revealed by improved vertical charge transport relevant to photovoltaic devices.