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Bandlike transport in organic molecular crystals revealed by subpicosecond transient photoconductivity

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The nature of charge carrier photogeneration and transport in organic molecular crystals is not completely understood. In particular, the mechanism responsible for the observed bandlike behavior of charge carriers in these materials, where the carrier mobility increases as the temperature decreases, remains unresolved and is the focus of much research. Using typical device structures to explore intrinsic properties of charge transport in organic semiconductors is complicated by the presence of defects and the necessity to make contacts to the sample. Recently, however, ultrafast techniques that use terahertz (THz) pulses for assessing the electronic properties of materials have been developed. In particular, time-resolved THz spectroscopy allows transient photoconductivity in materials to be probed with subpicosecond time resolution, providing a sensitive noncontact tool for studying the transport of charge carriers before they are trapped at defect sites. This talk will provide an overview of how THz pulses can be used to probe the nature of conductivity and bandlike behavior in organic molecular crystals and thin films.