Attosecond Electron Dynamics in Solids

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A new method of probing solid-state materials involves laser pump-probe measurements with attosecond light pulses produced by the process of high harmonic generation. Such radiation in the extreme ultraviolet or x-ray region interrogates core level transitions. The simple act of charge transfer from one atom to another or excitation of the band gap in a solid unveils many fundamental aspects that can be explored from a new viewpoint, on ever-shorter timescales. These include the extremely fast processes of core-level screening and broadening, coherences, and scattering, as well as electron configuration rearrangements. Topics in this presentation include semiconductor band gap excitation, charge transfer in metal oxides, core-level excitons in 2D metal dichalcogenides, and strong-field-induced Floquet Bloch bands. Lifetimes, scattering, and electronic coherences, as well as theoretical comparisons, will be considered. Coherent dynamics measurements in the extreme ultraviolet provide a novel and powerful probe for nonequilibrium states of matter.