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Excitonic Correlations and Their Relationship to Solid-State Microstructure in Polymeric Semiconductors

Wednesday 15 June 2016 11:00 (30 minutes)

This presentation will summarise a body of work emanating from our research group over the past five years. It focuses on correlating the properties of excitons with the complex solid-state microstructure in macromolecular semiconductors. In general, the optical properties of polymeric semiconductors are governed fundamentally by the interplay of electronic interactions occurring within a given polymer chain and those occurring between chains that constitute crystalline motifs. The competition between through-bond (intrachain) and through-space (interchain) electronic coupling determines two-dimensional spatial extent of excitons. The balance of these competing interactions depends very sensitively on solid-state microstructure of the polymer film (e.g. polycrystalline, semicrystalline with amorphous domains, etc.) Via analysis of absorption and photoluminescence spectral lineshapes, we have developed a protocol by which the spatial coherence of excitons, the degree to which the disordered landscape is correlated, and the interplay of intra- and interchain excitonic coupling in disordered polymeric semiconductors can be predicted when processing thin films within devices. I will outline novel ultrafast optical probes developed to probe in more detail the spectral correlations arising from excitonic properties of this class of materials.

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Session Classification: W-MEDAL1 CAP Medal Talk - Carlos Silva, U. de Montréal (Brockhouse Medal Recipient / Récipiendaire de la médaille Brockhouse)

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