UNIVERSITY OF SASKATCHEWAN

Prof. Ronald P. Steer

Short Course: Federal University of Santa Catarina

Molecular Photophysics for Optoelectronics

Introduction (1 hour)

Overview of photophysical phenomena, photonics, materials and devices (focus on organic materials)

Molecular Photophysics (5-6 lecture hours)

Introduction to photophysics: photon absorption and emission (ca. 1 lecture)

- phenomena and measurements
- vibronic structures of polyatomic molecules
- transition moments, polarization, integrated absorptivity, radiative rates

Intramolecular relaxation phenomena (1.5 lectures)

- intramolecular vibrational redistribution and the density of states
- radiationless transitions – theory and practice
    - internal conversion
    - intersystem crossing
    - Franck-Condon factors and the Energy Gap Law

Intermolecular relaxation phenomena (3.5 lectures)

- intermolecular vibrational relaxation
- electronic energy transfer
    - Förster (long range dipole-dipole)
    - Dexter (short range electron exchange)
    - annihilation phenomena
        - coherent and non-coherent upconversion
- electron transfer
    - Marcus-Hush theory
        - normal and inverted regions
        - reorganization energy
    - calculation of ΔG_{ET}: Rehm-Weller and beyond
    - charge separation and recombination