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Photophysics study in stretched polyfluorene thin films

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Abstract – Polarized emission spectroscopy and absorption measurements were used to characterize stretched thin films of two polyfluorene derivatives. For different stretching degree, the emission spectra of the linear polarized light parallel to the stretching direction presented an increasing in intensity while the perpendicular emission decreased. Absorption data also detected the orientation of polymer chains along the stretching. Energy transfer phenomenon is being used to explain the relation between perpendicular and parallel emission spectra.

Photophysical processes in conjugated polymers are important issues to understand the functionality of electro and photoluminescence polymeric devices. Although some important phenomena related to electronic transitions have been revealed [1] by spectroscopic techniques, recombination mechanisms and energy transfer effects are important to clarify the origin of luminescence in conjugated polymers, and is a current subject of investigation. In this study, we characterized stretched thin film of two polyfluorene derivative: (Poly[(9,9-dioctylfluorenyl-2,7-diyl)-co-(1,4-vinilenofenileno)]) (green emitter - GE) and Poly(9,9-dioctylfluorenyl-2,7-diyl) endcapped with N,N-Bis(4-methylphenyl)-4-aniline (blue emitter - BE). The films were obtained by spin-coating process and deposited on a ribbon of flexible Teflon. Stretched films were then characterized by absorption measurements and polarized emission. The data was analyzed in terms of parallel and perpendicular components of emission and excitation spectra. It showed an increase in the parallel emission intensity as the film was stretched, while the perpendicular emission decreased. The absorption curves presented a shift in the main peak indicating that the stretching induces an ordering in the polymer chain segments. The results are being analyzed in terms of recombination time of the exciton and energy transfer between different excitonic species.

References

[1] S.M. King, H. L. Vaughan and A. P. Monkman, Chem. Phys. Letters, 440, 2007, 268-272.