11th International Conference on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Investigation of Polyfluorene Based Polymers-Regenerated Cellulose Interaction Using Fluorescence Spectroscopy

R. A. Domingues[(1)], T. D. Z. Atvars[(1)*]

(1) Institute of Chemistry, Universidade Estadual de Campinas – UNICAMP, P.O. Box 6154, Campinas, 13084-971, SP, Brazil, e-mail: tatvars@iqm.unicamp.br

* Corresponding author.

Abstract – In this work was investigated the sorption of the fluorescent polyfluorene based polymer, poly[9,9-dioctylfluorenyl-2,7-diyl)-co-1,4-benzo-{2,1'-3}-thiadiazole)] (133 YE), onto modified cellulose fibers.

Emission spectroscopy was used for qualitative and quantitative analysis since probe has an intense fluorescence, and was observed a blue-shift when polyfluorene was sorbed onto the fibers. This phenomenon could be explained by an induced torsional motion shortening the conjugation lengths. Epifluorescence microscopy was also used and a uniform emission was observed in fiber after treatment.

Regenerated cellulose fibers, without previous treatment, was immersed into poly(fluorene) derivative solution and by measuring the fluorescence intensity of the solution during the sorption was possible to optimize the ideal time of immersion (Figura 1).

After sorption, fibers were dried in an oven under dynamic vacuum at 35 °C for approximately 24 h. Emission spectra of polyfluorene sorbed onto fiber was recorded showing a blue-shift compared to the solution or sorbed on glasses (Figure 2). This phenomenon could be explained by an induced torsional motion shortening the conjugation lengths.

Sorption of dyes on fibers is usually controlled by dye-fiber interactions which, in general, is a complex process involving electrostatic, van der Waals, hydrogen bonding, hydrophobic forces associated with lateral interactions and kinetic by the equilibrium between the solvation and desolvation processes. The prevalence of one or more types of interaction is determined by the chemical structure of the dye and by the surface, as well as by the surface morphology, topology, and charge[1].

Epifluorescence microscopy was also used and a uniform emission was observed in fiber after treatment (Figure 3).

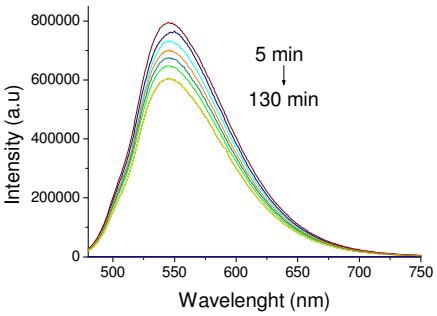

Figure 1: Fluorescence spectra of 133 YE solution in THF used during modified cellulose treatment. (λ_{exc} = 450 nm).

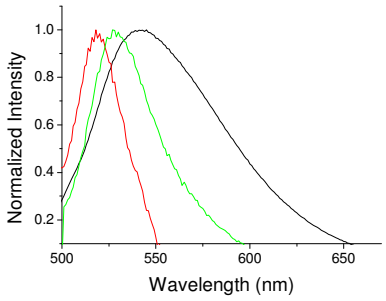

Figure 2: Fluorescence spectra in THF solution 1x10^{-7} mol L^{-1} (black) sorbed onto fiber (red) and sorbed onto glass (green) (λ_{exc}= 450 nm).

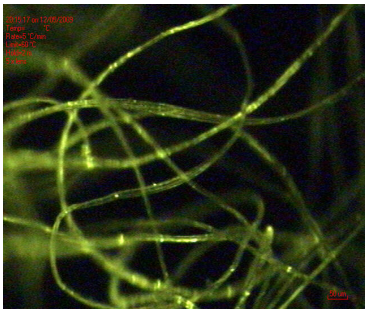

Figure 3: Epifluorescence microscopy of fibers sorbed with polyfluorene based polymer.

The authors gratefully acknowledge FAPESP, CNPq, CAPES and CNPq for financial support and fellowships.

References

[1] E.T.Iamazaki and T. D. Z. Atvars, Langmuir 23 (2007) 12886-12892.