

## SPECTRAL PROPERTIES OF HETEROCYCLIC CHROMOPHORE FOR STRUCTURAL COLORATION OF POLYMETHYLMETHACRYLATE

Sergio Barrientos<sup>2\*</sup>, Javier Revilla<sup>2</sup>, Enrique Martínez<sup>1</sup>, Ciro Falcony<sup>3</sup> & Dmitri Likhatchev<sup>1</sup>

<sup>1</sup> Instituto de Investigaciones en Materiales-UNAM. Apdo. Postal 70-360, Coyoacán 04510, México D.F.

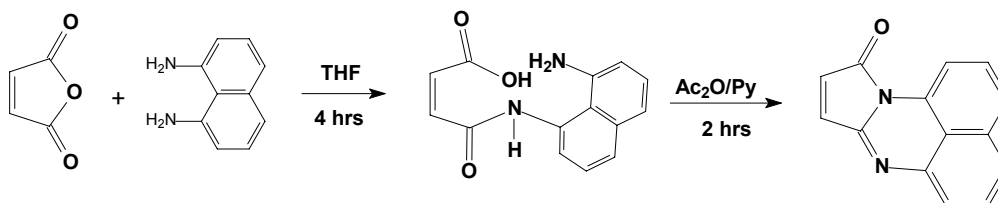
<sup>2</sup> CID-GIRSA, Av Sauces 87 mz 6, Parque Industrial Lerma, CP 52000, Lerma Estado de México

<sup>3</sup> CINVESTAV-IPN, Apdo. Postal. 14740, Gustavo A. Madero, 07000, México D.F.

e-mail: [clivsbar@mail.girsa.com.mx](mailto:clivsbar@mail.girsa.com.mx); [likhach@servidor.unam.mx](mailto:likhach@servidor.unam.mx)

### Abstract

It was recently proved that chromophore, Maleiperinone [10-H-Pyrrolo[1,2-a]-perimidin-10-one ], possess many properties that make them applicable to coloring synthetic polymeric materials. The new chromophore containing heterocyclic fused structure was synthesized using a novel room temperature synthetic approach. Catalytic cyclodehydration of the precursor amic acid resulting from the condensation of maleic anhydride with 1,8-diaminonaphthelene was found to be equally effective for the closure of both parts of the fused ladder-type heterocycle of maleiperinone (Scheme 1). Maleiperinone can be copolymerized via free radical of the double bond (Scheme 2) with MMA to yield intrinsically colored luminescent materials. The existence of a chemical bond between the monomeric PMMA unit and the chromophore was confirmed by UV-visible spectroscopy; the spectrum of the chromophore, that shows one intensive and broad absorption at 480 nm ( $\epsilon=6300 \text{ l mol}^{-1} \text{ cm}^{-1}$ ) typical for charge transfer complex. The polymers modified via chemical insertion of the fused heterocyclic chromophore exhibited an absorption maximum at 331 nm, which was consistent with the absorption of a model compound, succinylperinone. Then it is possible to determine the percent content of the covalently bound



**Scheme 1. Synthesis of Maleiperinone**

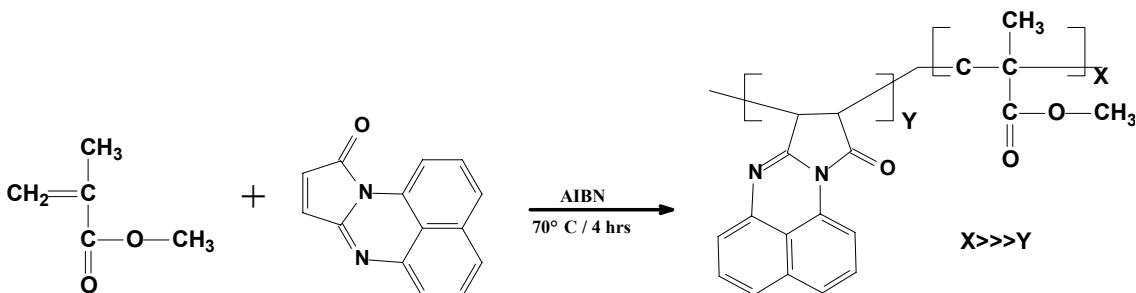
chromophore.

Direct insertion allowed chemically binding up to approximately 5% by weight of chromophore using bulk polymerization .

Results from the GPC analysis showed the effect in molecular weight, it decreased when the proportion of maleiperinone is increased. This behavior suggests that the chromophore has a lower relative reactivity ratio than MMA this might be attributed to the high stability of the formed free radical, which would also account for the apparent retarding and chain transfer effect. The new intrinsically colored copolymers showed two intense emission fluorescence spectra on the visible region at 460 and 520 when excited a wavelength at 260 nm. The intensity of this emission increases when the amount of chromophore increase in the PMMA-Maleiperinona copolymer.

The fluorescence phenomenon is not observed for the maleiperinone but it is present on the model compound. This is another evidence of a chemical bond between MMA and maleiperinone.

The intrinsic photoluminescence of these new copolymers makes them attractive for optical and optoelectronic applications, thus, further investigation of this materials as well as a studying the possibility of tuning the absorbing and emitting wavelengths may be of interest.



## Scheme 2. Copolymerization of MMA and maleiperinone

### References

- S. Barrientos; S. Granados; J. Revilla; E. Martínez; C. Falcony; D. Likhatchev. "Luminescent polystyrene and Polymethylmetacrylate via free radical copolymerization with maleiperinone" Memorias Materia 2001, Ciudad de México, Octubre 22 al 26, 2001.
- Granados Focil Sergio; Tesis Maestria "Inserción química de cromoforos luminiscentes a poliolefinas" IIM- UNAM, México D.F. 2001.
- Zimmer H; & Al-Khathlan H; J. Heterocyclic Chem. 25, 1047 (1988).