



Immobilization of an alternating copolymer containing fluorenyl groups in Langmuir and Langmuir-Blodgett films

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Abstract – Poly(9,9-dioctylfluorene)-co-phenylene, named copolymer 1, and poly(9,9-dioctylfluorene)-co-quaterphenylene, named copolymer 2, were synthesized by Suzuki reaction, and spread at the air-water interface in order to form Langmuir monolayers. Copolymer 1 does not form Langmuir monolayers alone, but when co-spread with dimyristoylphosphatidic acid (DMPA), it is arranged at the interface, interacting with the phospholipid monolayer, which is revealed by surface pressure and surface potential-area isotherms. However, copolymer-2 is able to form regular Langmuir monolayer alone or together DMPA. Both copolymers could be transferred to solid supports by using the Langmuir-Blodgett (LB) technique and its luminescent properties were studied by fluorescence spectroscopy.

Polyfluorenes (PFs) is a promising type of conjugated polymer with applications in optoelectronic owing to the emission properties in the blue, with commercial potential for organic light emitting diodes. Immobilization of these polymers in ultrathin may enhance its optical properties, and among the techniques used to fabricate coatings with molecular control, the Langmuir-Blodgett (LB) technique is an interesting way to obtain films with a defined number of monomolecular layers. However, the use of this technique for PF derivatives is not common. In this sense, this work aims to study the surface properties of two new PFs, Poly(9,9-dioctylfluorene)-co-phenylene, named copolymer 1, and poly(9,9-dioctylfluorene)-co-quaterphenylene, named copolymer 2, synthesized by Suzuki reaction, its transfer to solid supports as LB films.

Copolymer 1 could not be spread at the air-water interface, but when co-spread with dimyristoylphosphatidic acid (DMPA), it is incorporated as a Langmuir monolayer, as attested by surface pressure and surface potential-area isotherms. On the other hand, copolymer 2, with three more fluorenyl groups, could form by itself a liquid insoluble monolayer at the air-water interface, with collapse pressure attaining surface pressure values as high as 60 mN/m. Brewster Angle Microscopy has shown heterogeneity of the copolymer films, mixed with DMPA or pure at the interface.

The copolymers could be transferred to solid supports as LB films, rendering a Y-type film with thickness until 12 layers and UV-vis absorbance and fluorescence signals increasing with number of layers. However, saturation in terms of transferred mass was of 6 layers, which was proved by nanogravimetry measurements (crystal crystal microbalance). Fluorescence spectroscopy showed a huge signal for the LB films at the region of 400-450 nm, with is promising for their use for optical devices.

As conclusion, this work demonstrated the ability of the copolymers to form Langmuir monolayers and to transfer them to solid support as organized films at the molecular level, with enhanced and controlled optical (photoluminescence) properties for future viability as light emitting devices, and for sensing.