

# Synthesis of Amphiphilic Conjugated Random Copolymers with Solvent, Thermo and pH Responsive properties in Solutions.

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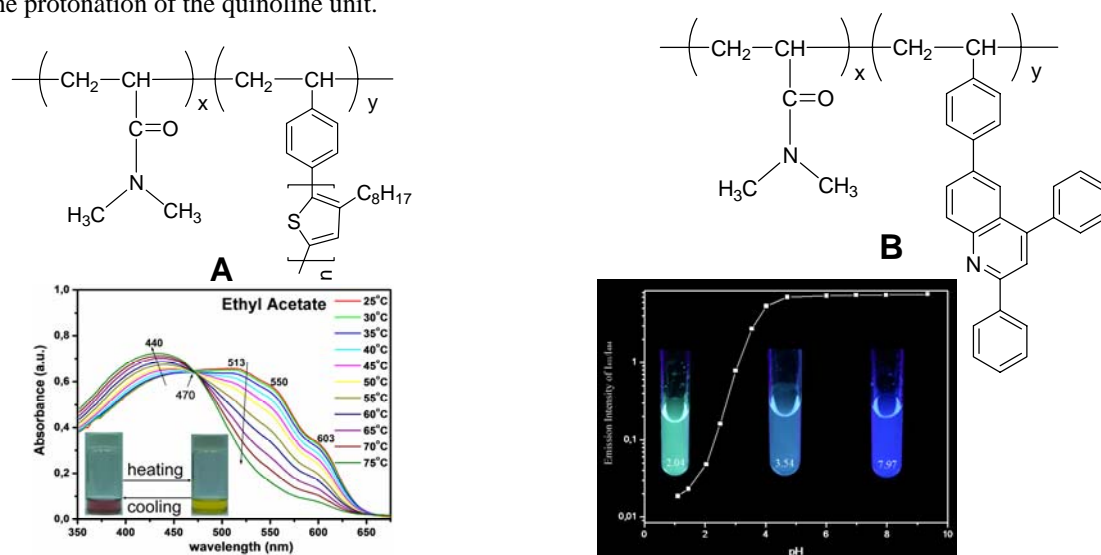
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Since the very first incorporation of chromophore units into polymers, the scientific interest in such polymeric materials is continuously increasing, mostly due to their important semiconducting properties. Nowadays, homopolymers and copolymers of such chromophores like quinolines or thiophenes, have been successfully used in several applications, including polymeric light-emitting diodes, organic photovoltaic devices and selective chemosensors. Although conjugated products have mostly been used in such applications, their low solubility has stimulated synthetic efforts towards alternative chromophores-containing products.

In this work we present the synthesis of random copolymers of properly modified polythiophene and quinoline vinyl monomers, with N,N-dimethyl acrylamide, via Free Radical Polymerization (copolymers **A** and **B**). The proportion of the chromophores in the copolymer chain is kept relatively low (<5%), so as to maintain the water-soluble character.

In the case of copolymer **A**, the optical properties of the copolymer in water and in several organic solvents of varying polarity, as well as in tetrahydrofuran/water and tetrahydrofuran/methanol mixtures, were explored using UV-Vis and photoluminescence spectroscopy. It is demonstrated that the rrP3OT chains adopt a coil conformation in solvents such as tetrahydrofuran and chloroform while on the contrary, they are organized on a single chain packing form (intrachain interactions) in polar solvents like ethanol and methanol. However, when water is used as solvent, the rrP3OT chains self assemble into a well stacked structure due to the increased interchain interactions. Moreover in ethyl acetate a thermo-responsive character was observed.

Concerning copolymer **B**, an interesting feature of quinoline-based polymers is their response to the acidity of the solution due to the weak basic character of quinoline. We should mention that the aforementioned polymer **B** is water-soluble, so that the respective pH-tuned photoluminescent behaviour in aqueous solution can now be followed. Thus, we are able to follow the photoluminescence properties of polymer **B** arising from the otherwise water-insoluble quinoline moiety, in an aqueous solution as a function of pH. The polymer has been proved to be a sensitive pH-responsive water-soluble photoluminescent indicator, changing color from blue to green under UV irradiation upon decreasing pH, as a result of the protonation of the quinoline unit.



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