

CONCLUSIONS

This thesis work concerned with the possibility to improve a method to produce silver nanoparticles in polymer films with better chances to regulate the morphology (diameter and density) of the nanoparticles in such a way that the optical and electric properties of the film could be finely tuned. The systems we took into consideration were Polymer Dispersed Metal Nano Particle (PDMNP) film of silver in poly acrylonitrile (PAN), obtained by polymerizing a precursor solution of Acrylonitrile by UV Irradiation. As we have explained in Chapter III our idea was to regulate the kinetic of two reaction schemes: one involving the reduction of silver cation by an acrylonitrile molecule, thus starting a cation assisted polymerization process, and the other related to the polymerization of the AN monomer without generation of silver nanoparticles, by using an independent photo initiator.

We have seen that, by adopting this strategy, it is possible to diversify, in a very efficient way, both the nanoparticle size and their density in the final polymer film. This effect can be easily verified when looking the morphology of films obtained by taking constant the silver nitrate concentration in the precursor solution and changing the amount of the independent photo initiator, and vice versa.

Basically we have verified that with increasing of the independent initiator concentration the density of the nanoparticles increases while their diameter decreases. The combination of the two factors brings anyway to lower the volume fraction of the metal nanoparticles into the film. The main physical properties, that is to say the electric conductivity and optical extinction cross section of PDMNP film modify according to the volume fraction of the metal nanoparticles and can be than finely tuned.

This work opens the way to get very transparent film with high electric conductivity to be used in future in electrochromic and other technology applications. In order to reach this goal it is sufficient to use precursor solution where the concentration of the silver nitrate and Irgacure will be planned in such a way that high densities of small nanoparticles will be obtained in the film.

We have also verified that basic model for electric conduction and optical transmittance can be used to have a logic interpretation of this type of PDMNP film properties.