Synthesis and characterization of semiconductor polymer doped with $FeCl_3$ and I_2

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The conductive polymer-based applications combine low cost, simple manufacturing procedure, flexibility and other properties. However, the low viscosity and solubility of these polymers make it difficult to produce layers by using industrial techniques. Among the most commonly used conjugated conductive organic polymers we can mention polyacetylene, polythiophene, polypyrrole, polyaniline, etc. In order to test them in further applications, new copolymers of thiophene and *p*-methoxybenzaldehyde were synthesized. The copolymers obtained will be characterized by several techniques (NMR, UV, CV, ATG, and electrical characterization). The study of the optical properties after doping is performed according to oxidation-reduction reactions by $FeCl_3$, I_2, in order to apprehend the redox behavior of this copolymer. The calculated value of energy gap Eg^{CV} of the studied polymers shows a decrease with the oxidation agent doping according to their oxidation potential, from 2.48 eV for the no doped copolymer passing by 2.22 eV for the copolymer doped with I_2 and up to 1.5 eV for the copolymer doped with $FeCl_3$. The decrease of the energy gap with the doping ($FeCl_3$ and I_2) corresponds to the increase of the conductivity with doping from $2.85 \cdot 10^{-5}\,S \cdot m^{-1}$ for no doped polymer to $7.86 \cdot 10^{-5}\,S \cdot m^{-1}$ for copolymer doped with I_2 and $1.55 \cdot 10^{-4}\,S \cdot m^{-1}$ for copolymer doped with $FeCl_3$.

Keywords: Thiophene, CV, *p*-Methoxybenzaldehyde, $FeCl_3$ and I_2.

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