proceedings

MDPI

Extended Abstract

Conductive Textile Coated with Polyaniline †

Ana-Maria Mocioiu [1,*] and Oana Cătălina Mocioiu [2]

[1] National R&D Institute for Non-ferrous and Rare Metals, 102 Biruinţei Blvd, Pantelimon, 077145 Ilfov, Romania

[2] Ilie Murgulescu Institute of Physical Chemistry of Romanian Academy, 202 Spl. Independenţei, 060021 Bucharest, Romania; omocioiu@icf.ro

* Correspondence: ammocioiu@imnr.ro

† Presented at the 16th International Symposium "Priorities of Chemistry for a Sustainable Development" PRIOCHEM, Bucharest, Romania, 28–30 October 2020.

Published: 17 November 2020

Keywords: SEM; PANI; PES textile

New trends in the development of conductive coated textile materials include applications such as supercapacitors [1], solar cells, sensors [2], electrochromic devices [2], etc. Electronic textiles and smart wearable devices are undergoing a rapid development and actively entering the user market [2–5]. Sensors and sensing systems detecting pressure, temperature, strain, as well as disease biomarkers and cellular metabolites, including glucose, lactate, and ascorbic acid have been successfully integrated into textile fabrics [2]. In this paper, we aimed to obtain textiles with electrically conductive properties improved by coating polyester textile with polyaniline. Due to the structure of polyaniline as a conjugate polymer containing aromatic rings and amino groups bonded by C=C double bonds, C–C bonds, and N–C bonds, high conductive properties were established.

Preparation of conductive fabrics requires the following reagents: aniline 99% (Sigma-Aldrich), HCl 37% (Sigma-Aldrich), ammonium persulphate (Sigma-Aldrich), and polyester fabric (from Romanian market). Coated textiles were characterized structurally by infrared spectroscopy with an Attenuated Total Reflection (ATR) device and morphological by scanning electron microscopy (SEM). The surface resistivity of the fabrics was measured according to standard SR EN 1149-1:2006 employing the two electrodes method, using a PROSTAT 800 m.

The coated textile material presented a green dark color and permeability in the air of 1076.6 $L/m^2/s$; surface resistivity had a value lower than $10^5\ \Omega$.

Figure 1 shows the morphology of the polyester textile coated with polyaniline by "in situ" polymerization using HCl. The infrared spectrum in Figure 2 showed characteristic bands of polyaniline, as reported in other papers [3–5]. The bands assignments are presented in the Table 1.

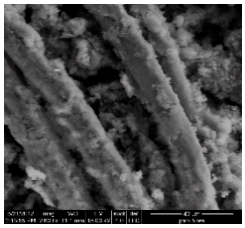

Figure 1. SEM image of polyester textile coated with polyaniline.

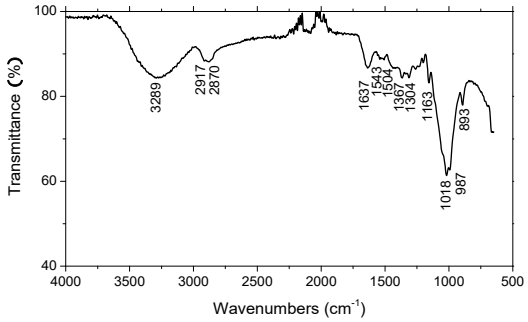

Figure 2. Infrared spectrum of polyester textile coated with polyaniline.

Table 1. The frequencies characteristic in infrared for polyester coated with polyaniline

Assignment	Bands Position
C-N and N-H stretching	3289
C-H stretching in benzene	2917
C-H stretching	2870
N=Q=N	1637
N–B–N	1543, 1504
C-N stretching in Q– B states	1367, 1304, 1163
Methyl group attached by phenyl ring	1018, 987
Para di-substituted aromatic rings indicating polymer formation	893
C-H deformation out-of –plan	Below 665

In conclusion the experiment shows uniform coating and good electrical properties for the studied textile coated with polyaniline. The conductivity increased by six times in coated vs. uncoated polyester textile.

References

1. Etana, B.B.; Ramakrishnan, S.; Dhakshnamoorthy, M.; Saravanan, S.; Ramamurthy, P.C.; Demissie, T.A. Functionalization of textile cotton fabric with reduced graphene oxide/MnO_2/polyaniline based electrode for supercapacitor. *Mater. Res. Express* **2019**, in press, doi:10.1088/2053-1591/ab669d.
2. Gicevicius, M.; Cechanaviciute, I.A.; Ramanavicius, A. Electrochromic textile composites based on polyaniline-coatedmetallized conductive fabrics. *J. Electrochem. Soc*. **2020**, *167*, 155515.
3. Mocioiu, A.M.; Dumitrescu, I.; Cincu, C. Composite materials with conductive polymers content. *IndustriaTextilă* **2013**, *64*, 106–110.
4. Mocioiu, A.M.; Dumitrescu, I.; Cincu, C. Electroconductive properties of nylon 6,6 and cotton fabrics by "In Situ" polymerization of aniline in one step reaction without re-doping. *J. Opt. Adv. Mat*. **2013**, *15*, 1106–1112.
5. Dumitrescu, I.; Nicolae, C.A.; Mocioiu, A.M.; Gabor, R.A.; Grigorescu, M.; Mihailescu, M. Synthesis and characterization of conductive polymers with enhanced solubility. *U.P.B. Sci. Bull. Ser. A* **2009**, *71*, 63–72.