Electrical properties of composites of poly (lactic) acid and polyvinylidene difluoride with carbon fillers

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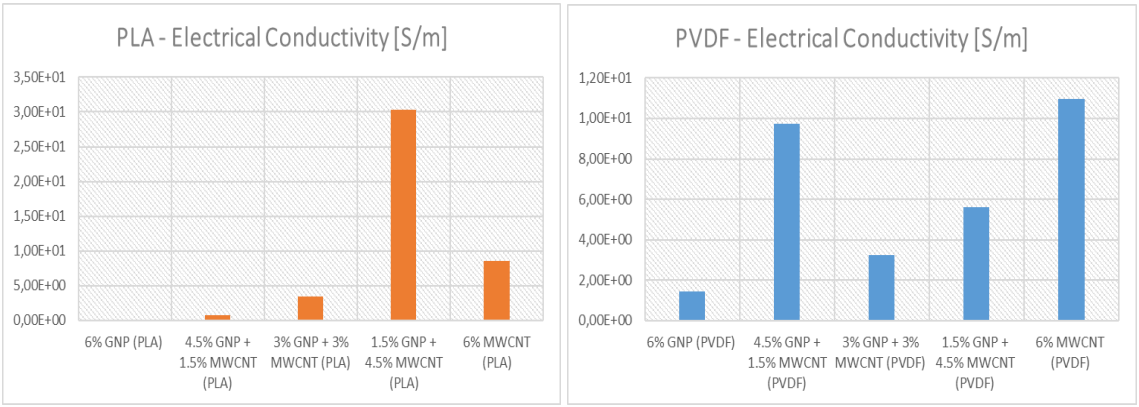
1. Introduction

In this study, we consider polymer composites based on two different matrices with the same fillers in terms of electrical conductivity. The study does not aim at a comparison between the two polymers, the focus is on the effect of the fillers on different polymer matrices. Unconventional polymer nanocomposites based on PLA and PVDF, made of multi-walled carbon nanotubes (MWCNT), graphene nanoplates (GNP), and a combination of the two fillers (MWCNTs / GNPs) have been developed.

The method chosen to obtain the nanocomposites is by melt extrusion. Monofill nanocomposites (GNP / polymer and MWCNT / polymer) with 6% by weight of filler content as basic mixtures are produced. Composites with bi-fillers with a total filler content of 6% by weight are prepared by mixing the two fatty mixtures with a mono-filler in a suitable ratio. The resulting composites were extruded on a Thermo Scientific Process 11 Parallel Twin-Screw Extruder. The radar temperatures in the extrusion of composites with PLA matrix were in the range of 170–180 ° C, and in the extrusion of PVDF in the range of 160–170 ° C.

2. Results and Discussion

Figure 1 shows the DC electrical conductivity for PLA and PVDF fibers reinforced with various combinations of thread-shaped carbon fillers used. It should be noted the more pronounced influence of MWCNT in increasing electrical conductivity.[1] The difference in the conductivity of pure polymers and composite materials is several orders of magnitude higher. This can be explained by obtaining functioning electrically conductive paths between the individual nanoparticles, thus changing the insulator to a conductor, making the passage of electrons.[2] From the graphs we notice that the two groups are differently influenced by the fillers. While in the group with the PVDF matrix we report better conductivity in monofilters, in the case of PLA-based composites the bi-fillers clearly achieve better conductivity.[3]



A) B)

Fig. 1 Presented in DC the conductivity of shaped fibers at 6% by weight concentration of the filler with PLA and PVDF matrices.

3. Acknowledgement.

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4. References

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