OBTAINING AND CHARACTERIZATION OF NOVEL HYBRID COMPOSITE MATERIAL BASED ON $LaMnO_3$:Ag AND POLYVINYLPYRROLIDONE

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Abstract

Polymer-perovskite nanocomposites have attracted the attention of researchers as multifunctional materials for the development of flexible components/devices with many significant technological uses, in which the favorable characteristics of inorganic perovskite nanofiller and organic polymer are effectively integrated [1].

Nanosized filler polymer composites exhibit outstanding properties due to the unique characteristics of nanoparticles, such as the high surface-to-volume ratio and large interfacial area formed between the matrix and nanoparticles, with enhanced mechanical, electrical, and thermal properties. Nanocomposites that combine the advantages of polymer and filler (ceramics) can be processed more easily and are viable alternatives to plain/doped ceramic materials [2].

The procedure for obtaining the hybrid material consists in mixing the precursors in a mass ratio of 20:1 (Polyvinylpyrrolidone/$LaMnO_3$:Ag) and dispersing them in distilled water. The resulting suspension was stirred for 2 hours maintaining the temperature at 80°C, at 400 rpm. The resulting viscous mixture was cast into thin film of 2-5 mm thickness on a flat surface (polypropylene film) and dried at room temperature for 12 hours. The polymer-perovskite film was triturated until a homogeneous mixture with small grain size (up to 1 mm) was obtained and then dried in a forced convection oven, at 60°C for 12 hours.

The major advantage of this method is the obtaining of nanomaterials with small dimensional distribution, of nanometric order, in a relatively short time interval, with controlled morphology and uniform distribution of particles, and with a large specific surface area. Another advantage of this method is the better control over the growth rate of the particles, at a relatively low working temperature (80 °C).

To determine the crystal structure, the obtained hybrid materials were characterized by X-ray diffraction, UV-VIS and RAMAN spectroscopy. Also, to highlight the morphology of the particles, the scanning electron microscopy was used.

References

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