NOVEL POLYMER-PEROVSKITE NANOCOMPOSITE BASED ON $LaMnO_3$:Pd AND POLYVINYLPYRROLIDONE

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Abstract

Perovskites represent promising materials due to advantages such as chemical and photo-stability, low production cost, modifiable energy in the band gap, high absorption properties, long carrier lifetime and diffusion length, which can be used in green and sustainable environmental applications [1]. Despite the high dielectric constant and multifunctionality of perovskite materials, they possess high density, brittleness and low dielectric strength, as well as poor processability [2]. PVP is a water-soluble, non-toxic amorphous nonionic polymer, with high solubility in polar solvents, widely used in the synthesis of nanoparticles [3] acting as a nanoparticle dispersant, growth modifier, surface stabilizer, preventing agglomeration of nanoparticles [4]. Due to its amphiphilic nature, PVP can affect the morphology and growth of nanoparticles by providing solubility in various solvents, discriminative surface stabilization, controlled crystal growth, playing the role of a shape control agent and facilitating the growth of specific crystal faces, while preventing the growth others [4].

The aim of this research is to obtain a new hybrid material based on polyvinylpyrrolidone (PVP) polymer functionalized with perovskite structures of the $LaMnO_3$ type doped with Pd, in aqueous medium at 80°C. After mixing the precursors in a mass ratio of 20:1 (PVP:Perovskite) and dispersing them in distilled water, from the viscous mixture, thin films were obtained. These were triturated to obtain particles smaller than 1 mm. The powder was dried and analyzed using SEM/EDAX, X-ray diffraction, UV-VIS, RAMAN spectroscopy in order to completely characterize the nanocomposite. The combination between $LaMnO_3$:Pd perovskite and PVP resulted in a multifunctional material, with favorable characteristics of inorganic perovskite nanofiller and organic polymer effectively integrated.

References

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