$NaPO_3$-$CaCl_2$ glasses containing Ag@SiO_2 nanoparticles

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Glasses obtained by the process of coacervation allows to incorporate inorganic compounds, such as metallic nanoparticles and rare earth ions, which can be used for several optical materials. These nanoparticles were prepared previously by the simple reduction of a metal precursor, followed by the synthesis of a silica shell around the metal. This new route allows to obtain a well dispersed nanocomposite of glass and nanoparticle without a heat treatment (for nucleation and growing) stage.[1]

Two different nanoparticles were prepared, with two different sizes 22,6 and 29,1 nm, called Ag1 and Ag2, respectively. The Figure 1 shows the matrix of $NaPO_3$-$CaCl_2$ and the nanocomposites obtained.

Figure 1 - Matrix and nanocomposites

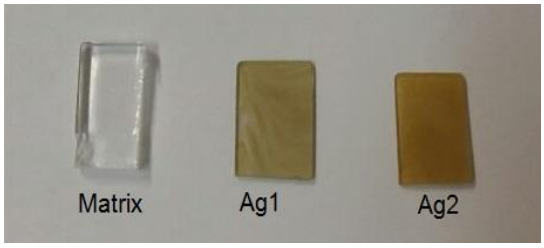
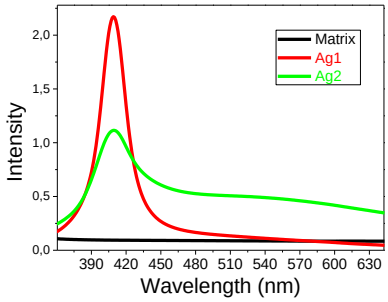


Figure 2 - UV-VIS spectrum absorption



The Figure 2 shows the absorption spectrum in the UV-Vis, where was possible to see that the nanocomposite of silver nanoparticles Ag1 showed a plasmon band focused in 407 nm, narrow and well-defined. Although, the nanocomposite containing Ag2 showed an enlargement of the plasmon band in 407 nm and the start of the formation of a second band, in 550 nm, due to the maturation of Ostwald during the synthesis of Ag2.[2]

With the Differential Scanning Calorimetry (DSC), was obtained the glass temperature (Tg) for the matrix and the glasses-ceramics containing Ag1 and Ag2, and they were 409, 420 and 425º C, respectively, and it's possible to verify how much they are close, and the nanoparticles doesn't cause big changes in the matrix structure. This measure agrees with the Resonance Magnetic Nuclear (RMN) of phosphorus made for the materials, which demonstrated that the P-O-P were the preferential bonds, showing that, even with the nanoparticles, the structure is the same.

The results, obtained so far, allows to demonstrate that the silver nanoparticles were incorporated in the matrix of NaPO3-$CaCl_2$, without big changes in the matrix's sctructure.

1 – R. Müller, E.D. Zanotto and V.M. Fokin; J. Non-Cryst. Solids **2000**, 31, 274.
2 – Ostwald, W. Analytisch Chemie **1901**, 3 ed.

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