Ahmed Bachar et al., Madridge J Nanotechnol Nanosci. 2016
http://dx.doi.org/10.18689/2638-2075.a1.002

Silicate glasses including silver nanoparticles: Annealing conditions correlated to optical and structural properties

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Glasses containing noble metal nanoparticles have been extensively investigated in the past decades because of their excellent properties such as ultrafast optical response and large third-order non-linear susceptibility. Nonlinear optical materials, such as composites formed by metal nanoclusters in glass, are potentially important in the field of all optical switching technology. Many methods have been used to produce metallic (Au, Ag, Cu) nanoparticles, many of them describing chemical reduction techniques, some of them are concerned with formation of silver nanoparticles in matrices using ionic-exchange processes or laser beam, like soda-lime silicateglasses. In this work, we study the effects of network nature and the annealing conditions (temperature and atmosphere nature) on the coloration of silicate and borosilicate glasses doped with silver or gold oxide. Evolution of such structural glasses during annealing is studied by MAS NMR spectroscopy of ^{29}Si, ^{11}B and ^{23}Na. The dispersed nanoparticles have been examined by Transmission Electron Microscopy (TEM). The Optical Absorption Spectroscopy applied to colored glasses has given rise to the Surface Plasmon Resonance at around 420 nm (550 nm) which is characteristic of silver (gold) nanoparticles. The characterization of optical non-linear properties is in progress for these matrices.

Biography:

Ahmed Bachar received a PhD in materials chemistry from the University of Valenciennes, France. He is currently a CNRS researcher at the "*Extreme Conditions and Materials: High Temperature and Irradiation*" (CEMHTI) laboratory, University of Orleans, France. His research focuses on glass materials, metallic nanoparticles, anameling of functionalized surface and ceramic. He published around 20 papers in international research journals and got many participations in conferences and workshops.