DC electric field assisted dissolution of embedded silver nanoparticles in glass matrix: The phenomena and its Application

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Abstract: A novel, easy-to-implement, technique to engineer optical and structural properties of dielectric metal-doped nanocomposite materials via gaining control over spatial distribution of metallic inclusions is presented. The potential applications of the presented technique is discussed.

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The linear and nonlinear optical properties of metallic nanoparticles embedded in dielectrics are strongly dominated by the SP resonances of the particles. The SP resonances, in turn, can be designed within a wide spectral range throughout the visible and NIR by choice of the metal, dielectric matrix and also manipulation of size, shape and spatial arrangement of the metal clusters to meet the ever demanding applications.

Here we introduce a simple, but physically very interesting, method for fine optical structuring in glass containing either spherical or elliptical silver (Ag) nanoparticles, employing an intense DC electric field ($\leq$1kV) and modest temperatures ($\leq$300°C) only. In the talk the dissolution process will be detailed and also refractive index engineering as well as submicron structuring in metal-doped nanocomposite glasses, as examples of applications of the discussed technique, will be presented.