# Enhanced downconversion emission in Eu- doped zinc-tellurite glasses induced by metal nanoparticles, for solar cell applications

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The coupling between lanthanides and metal nanoparticles has been observed to modify the local photonic mode density (PMD) due to the localized surface plasmon resonance which is highly appealing from the technological view point. The $Eu^{3+}$-doped tellurite glasses containing gold or silver nanoparticles were prepared by melt-quenching technique. Nanoparticles are formed by subsequent heat-treatment of the co-doped glasses at around the glass transition temperature. Under both resonant and non-resonant excitations the luminescence intensity of $^5D_0$–$^7F_{0;1;2;3;4}$ transitions of $Eu^{3+}$ ions are found to be enhanced due to the presence of these nanostructures. The lifetime of the excited state of $Eu^{3+}$ ions did not change in case of silver while a significant change is observed in case of gold nanoparticles. The enhancement of luminescence is mainly attributed to the presence of metal NPs with average diameter of about 2 nm for gold and 8 nm for silver (as observed in transmission electron microscope) as well as energy transfer from nanoparticles to rare-earth ions. Furthermore, the alteration of the $Eu^{3+}$-luminescence intensity is related to the size and shape of nanoparticles which in turn depend upon the diffusion and growth of these metal nanostructures inside the glass matrix. This study can provide a comparison for the different mechanisms involved in modifying the luminescence intensity of lanthanides under the influence of two different metal species (silver and gold) within the same glass host whose understanding is complimentary for the real applications of these nanocomposites.