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White luminescence from sol-gel silica doped with silver

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Abstract content
   (Max 300 words)
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Many researchers have recently been attracted to research white phosphors for applications in solid state lighting with the goal to replace fluorescent lamps. White light can be generated from light emitting diodes by two basic approaches, namely by mixing light of different colours using different emitting chips or by the use of phosphors to convert the light emitted from a blue or ultraviolet chip to longer wavelengths. Silicon dioxide (SiO₂) is a potential candidate material for optoelectronic applications because it is environmental friendly, low-cost, easy to fabricate and has good thermal and chemical stability. Much attention has been paid to SiO₂ doped with impurities to control its luminescence for different applications. In this study, undoped and Ag doped SiO₂ were prepared by the sol-gel method and annealed in air for 2 h at 1000 ℃. The undoped sample showed photoluminescence emission in the range 400 - 500 nm which has previously been attributed to oxygen deficiency related defects. The addition of 1 mol% Ag caused significant broadening of the SiO₂ emission compared to the undoped sample and two new peaks in the ultraviolet and red regions were observed. The formation of Ag nanoparticles in the SiO₂ was confirmed by X-ray diffraction, ultraviolet diffuse reflection and X-ray photoelectron spectroscopy data. The additional red luminescence changed the emission of the pure SiO₂ from blue with CIE coordinates (0.22, 0.19) to emission with CIE coordinates (0.32, 0.34) when Ag was added, which is very close to pure white light having CIE coordinates (0.33, 0.33). The origin of the new peaks related to doping with Ag will be discussed.

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