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## Influence of Ag doping coupled with calcinations on anatase to rutile transition of Titania made by sol-gel sonication

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Nanomaterials like titania ($TiO_2$) are stable under both acidic and alkaline conditions. $TiO_2$ has wide band gap (3.2 eV) limitations that are ultraviolet radiation sensitive. The challenge is to increase the photo response to make their nanoconjugates excited by visible light. And many processes have been broadly adopted. Most promising modification attempts reported so far are the substitution doping of metals or non-metals. Sol-gel provides low processing temperature, high homogeneity and stability. Pecchi et al. reported on synthesis of $TiO_2$ under different gelation pH and calcination temperatures. In this work, we report on the novelty of combining two previously reported techniques, sonication and sol-gel methods to synthesis (Ag doped $TiO_2$) nanosized Ag-T that has two coexisting phases (anatase and rutile). The calcination temperature effects in the UV light region coupled with Ag doping effects in the visible light region were also investigated. The UV-Vis reflectance analysis result of Ag-T absorption maxima showed a red shift towards a higher wavelength after Ag doping $TiO_2$, hence the reduction from 3.2 eV to approximately 2.8 eV of the band gap. The crystallite size of 6 nm was reduced to 5.5 nm with an increased surface area as revealed by BET from 233 $m^2/g$ to 278 $m^2/g$. Santana-Aranda et al investigated on physical properties of $TiO_2$ nanoparticles prepared by sol-gel and obtained the surface area, crystalline particle sizes and pore volume values as 80.8 $m^2/g$, 12 nm and 0.187 $cm^3/g$, respectively compare to 233 $m^2/g$, 6 nm and 0.27 $cm^3/g$ of our result.

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