

New process of rapid thermal annealing to create gold nanoparticles

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Metallic nanoparticles (NPs) are the very potentially materials today. They are being fabricated and applied in many different fields. Gold nanoparticles (Au NPs) are added to the solar cell structure to take advantage of the plasmonic effect to increase cell efficiency [1]. They are also used for a wide range of biomedical applications, including bio-imaging, lateral flow assays, environmental detection and purification, data storage, drug delivery, biomarkers, catalysis, chemical sensors, and DNA detection [2]. Silver NPs solution is used in disinfection technology [3] while aluminum or copper NPs mixture is used as paste in ink-jet printing electronic devices [4].

Metallic NPs are often created by chemical methods and exist in suspensions form in solution [5-7]. Some recent researches tried to create them by physical methods [8, 9] but it is difficult to control their size and shape. It will limit the applications of NPs because these parameters have a strong influence to the optical and electrical properties of NPs [1].

In our work, the Rapid Thermal Annealing (RTA) process is used to create Au NPs on silicon substrate. The shape of Au NPs was tried to control by changing the inert gases environment in the oven. Spherical Au NPs is created with nitrogen annealing gas while hemispherical Au NPs, which have stronger plasmonic effect [1, 10], is created with argon. All phenomena occurring on the silicon surface as well as on the silicon-gold interface are studied to explain the differences in the obtained results.

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