one at 2Θ =38.2° (111) and the other at 2Θ =65° (220). We have noted in case of using sapphire substrate for gold thin ilm deposition, XRD diffraction peaks are much wider than in XRD peaks in case using glass one. That is means; the size of crystallite of gold thin ilm deposited onto sapphire substrate is smaller than that the size of the gold crystallite deposited onto glass substrate Y/2 01[.

Conclusion

We elaborated gold thin films with nanometer-scale roughness by controlling the parameters of PLD technique. The experimental results have shown that, the particles density of the deposited gold films increases to reach to 60 particles in μm^2 at incident laser pulse power at 400 mW and is fixed at powers 500 mW and 600 mW, while it falls at higher laser power from 600 to 700 mW. Also, as the power of the incident femtosecond laser pulse increases the average mean radius of the deposited nanoparticles increase which mean decreasing of particle density (number of particles per μm^2) accompanied with the increasing of the particle size. We have noticed that, at the 500 mW, a clear gold single crystal is formed. The advantage of femtosecond PLD is the fact, the target material undergoes rapid heating without any significant collateral damage to the bulk could potentially lead to a reduction in emission of Melton droplets. However, mechanisms such as phase explosion and photomechanical fragments can lead to the formation of nanoparticles from the ablated target, which would be detrimental to the quality of films intended for laser wave guide application. fs- Second laser nanostructure gold thin films by pulsed laser deposition techniques have many applications in the field of Nano photonics or Nano optics. Since nanostructures are able to affect light and control it on a nanometer scale, they have given rise to a variety of applications: e.g., surface enhanced spectroscopy plasmonic sensors solar cells superlenses plasmonic beam shaping and collimation chiral metamaterials and medical applications.

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