Solvent effects on pulsed laser ablation in liquid (PLAL) using microchip laser for preparation of gold nanoparticles

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Pulsed laser ablation in liquids (PLAL) is one of the promising techniques in the field of metal nanoparticles (NPs) synthesis. It is based on the use of a liquid-phase synthesis route of NPs with the assistance of the pulsed laser ablation process. So far, attempts to prepare polymer-stabilized gold nanoparticle by PLAL have been investigated using conventional large laser system. The cutting-edge discovery of microchip laser system by Taira et al. introduced the new era to utilize the laser technique in more convenient manner.[1] While it is well known that gold nanoparticles can be ablated from bulk gold in large laser systems, laser ablation using low-power microchip laser systems has not been explored.

In this study, we report gold nanoparticles (AuNPs) stabilized by polymers, such as poly(*N*-vinyl-2-pyrrolidone) (PVP) and polystyrene, are prepared by PLAL method using microchip laser. By increasing PVP concentration diminishes the ablation rate due to the increase in solution viscosity (Fig. 1). The average size of the AuNPs stabilized by polystyrene highly depends on the solvent. It is attributed to the aromatic solvents decomposition such as toluene occur under the laser irradiation and makes graphitic carbon (GC) mentioned by Meneghetti's previous approach.[2] GC layer thickness could be reduced by optimizing the laser power and polymer concentration In which high polymer concentration absorb heat from the generated NPs thereby reduce the solvents decomposition and GC layer thickness.

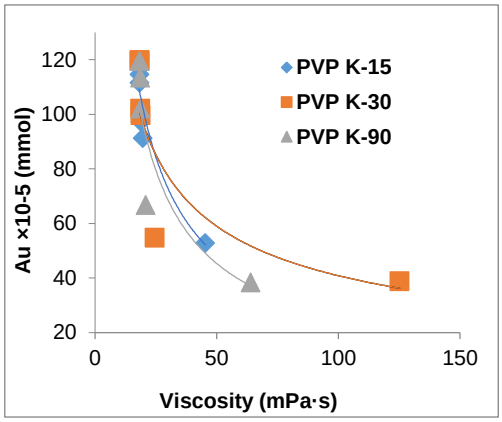

Fig 1. Viscosity effect on Au NP ablation efficiency.

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2) V. Amendola, G. A. Rizzi, S. Polizzi, M. Meneghetti, *J. Phys. Chem. B* **2005**, *109*, 23125.