Production of composite nanoparticles by ablating along the contact line of silver and gold plates placed in V geometry

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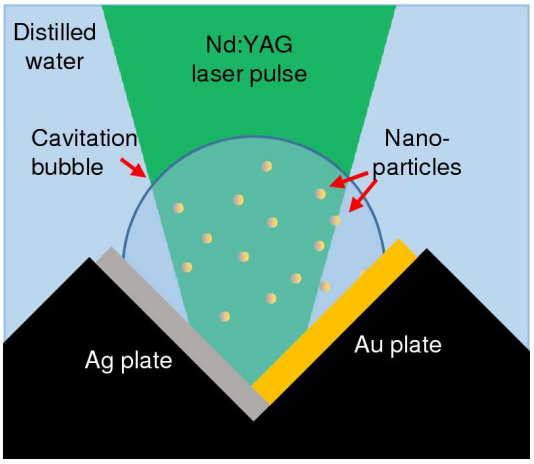
The possibility of generating alloy nanoparticles (NPs) by pulsed laser ablation in liquid (PLAL) of various metal targets is an area of intense research. The application of alloys and power mixtures as the irradiated target material is the most straightforward method [1]. However, multilayer targets have also been proven to be applicable, although the mixing of the components may be limited [2]. In our earlier study, NPs were produced by ablation of gold-silver multilayer targets. While for small layer thicknesses the average Ag:Au content correlated with the compositional ratio of the ablated structure, the yield was relatively low. The application of thicker layers resulted in NPs with compositional ratios slightly different from that of the target structure [3]. In our present work, we used a different geometry for mixing the Au and Ag components produced by ablation: the silver and gold plates were placed in close contact in a V geometry as shown in the figure below. Focused beam of a nanosecond Nd:YAG laser (532 nm) was used for the ablation. In order to ablate both target materials simultaneously and avoid crater formation, the beam spot was scanned along the contact line of the two plates. In this geometry, we expected the mixing of the material ablated from the two target materials. Energy dispersive X-ray spectroscopy analysis revealed the formation of a significant amount of alloy NPs in addition to pure Au and Ag NPs. The total fractional composition of the particles produced was estimated by UV-Vis absorption spectroscopy. The efficiency of the method was studied at different experimental parameters.



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