Supporting Information

Investigation of laser-induced inter-welding between Au and Ag nanoparticles and the plasmonic properties of welded dimers

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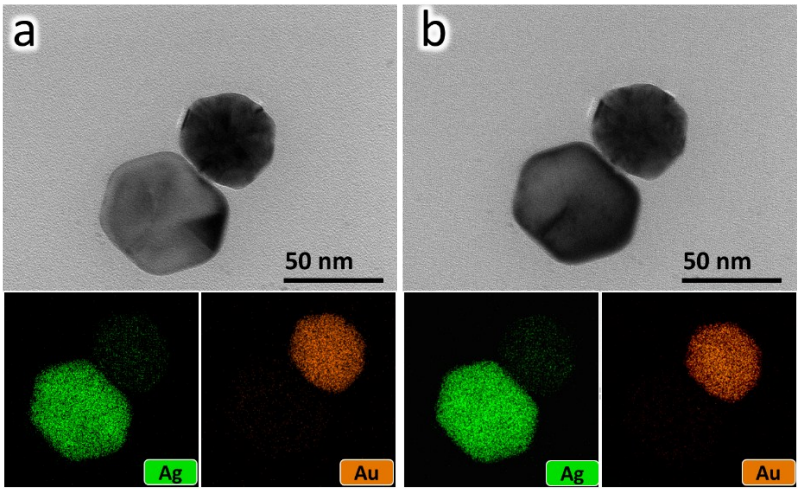

Figure S1. Bright field TEM image and EDX mapping of an Ag-Au NP dimer captured (a) before and (b) after 10 minutes of electron beam irradiation with a beam intensity comparable to the one used during the laser irradiation experiments. It is clear that changes in the structure and composition of the dimer are insignificant when it is only exposed to the electron beam. (The difference in the contrast of Ag NP is mainly caused by the slight change in beam-crystal orientation relationship)

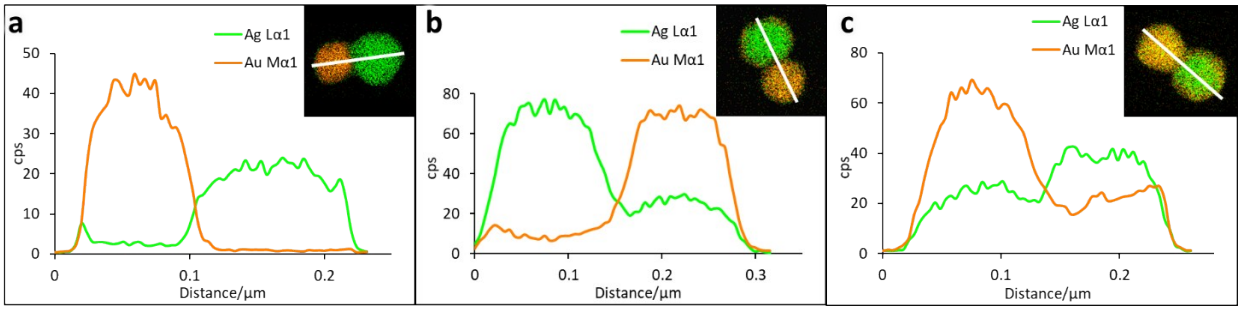

Figure S2. Linescan results for NPs in Figure 3b, 3c and 3d respectively.

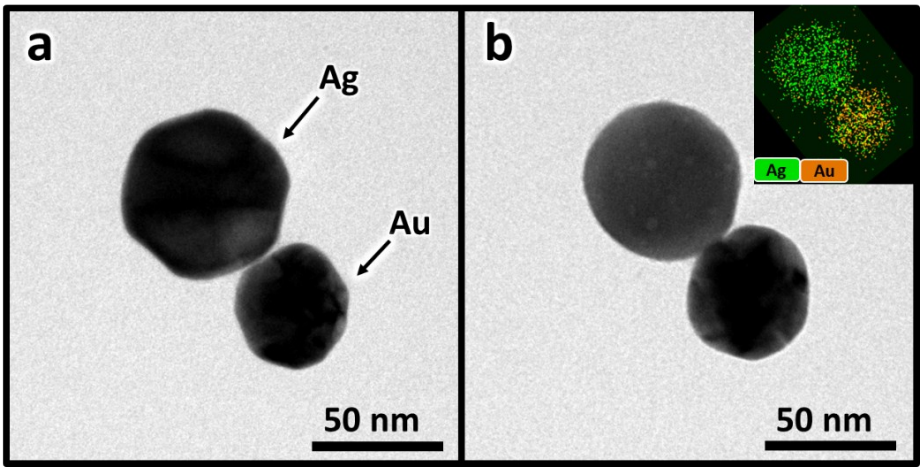

Figure S3. Bright field TEM images of Au-Ag NPs (a) before and (b) after laser irradiation. Inset: A fast EDX mapping to show the composition of two NPs.

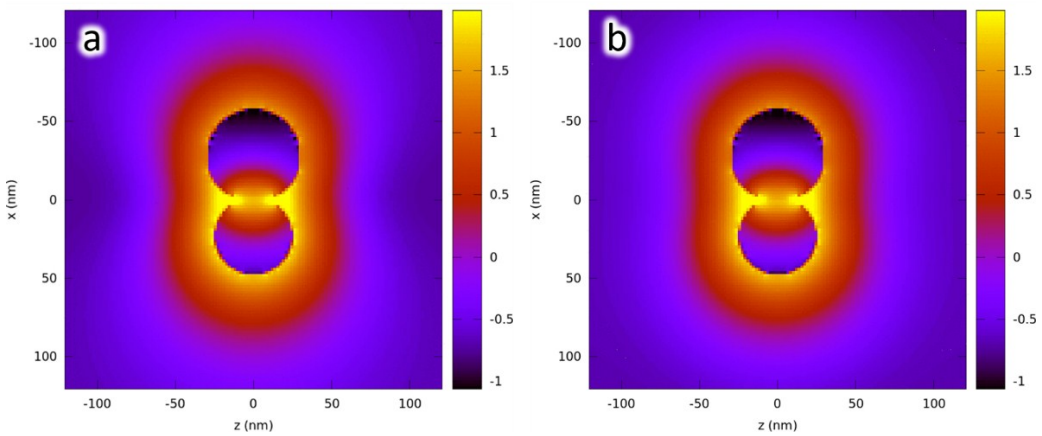

Figure S4. Electric field (log scale) at plasmon resonance around two types of dimers with an overlapping distance of 4nm. (a) Ag NP (60nm) + Au NP (50nm); (b) Ag NP (60nm) + Au@Ag core-shell NP with a core size of 46nm and shell thickness of 2nm. Those two dimers represent the structures formed in stage i and ii as described in the paper.

Videos

Movie S1. Movie of the merging of two nanoparticles under laser illumination inside UTEM. A duty cycle mode was used, with 200 laser pulses on and 800 pulses off during each cycle. The averaged laser power was 2mW.

Notes: In the video, the composition of nanoparticles are unknown as UTEM was operated in the bright field imaging mode which cannot show Z contrast. However, the composition does not matter too much in this stage since we are studying the structural evolution rather than compositional evolution. Different metallic nanoparticles should show very similar welding or sintering behaviors as determined by the energy minimization principle. Therefore, we do not differentiate between the welding of Au-Au, Ag-Ag and Ag-Au NPs regarding the structural evolution.