

## Supplementary Materials

# **Laser Irradiation-Induced Pt-Based Bimetallic Alloy Nanostructures Without Chemical Reducing Agents for Hydrogen Evolution Reaction**

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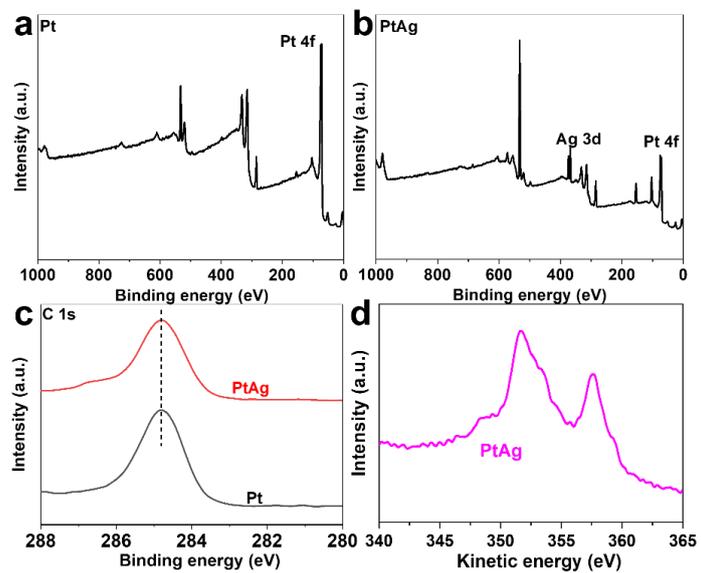
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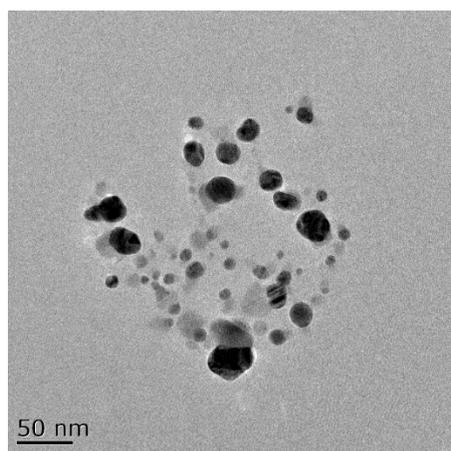
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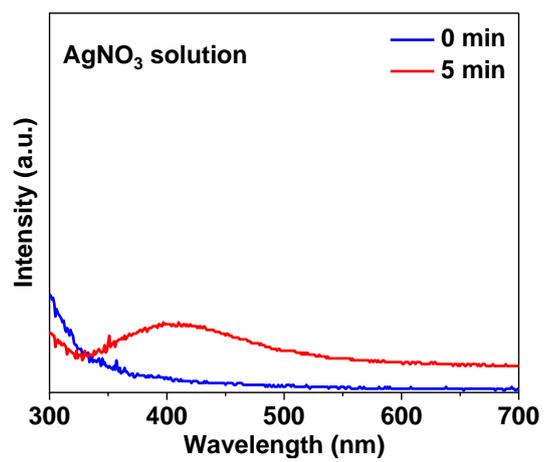
E-mail: [chliang@issp.ac.cn](mailto:chliang@issp.ac.cn); [pfli@issp.ac.cn](mailto:pfli@issp.ac.cn) . # These authors contributed equally to this work.



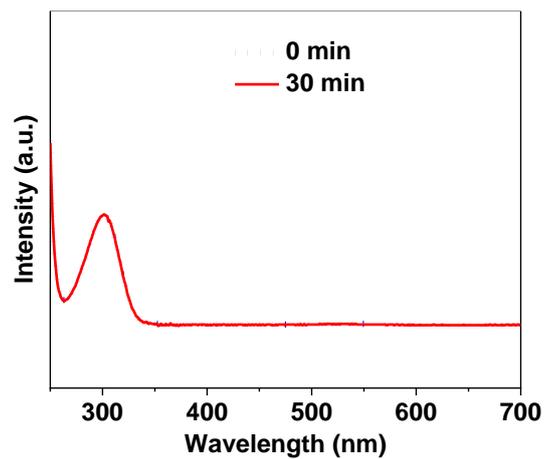
**Figure S1.** (a-b) XPS spectrum of Pt and PtAg alloys, (c) C1s of Pt and PtAg alloys, (d) the auger electron spectrum of Ag for PtAg alloys.



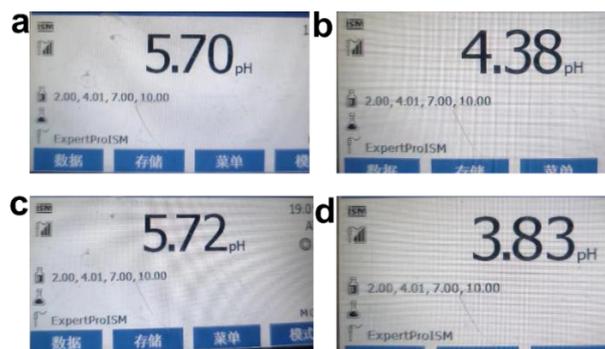
**Figure S2.** The Ag NPs were obtained by irradiating the  $\text{AgNO}_3$  solution with laser irradiation.



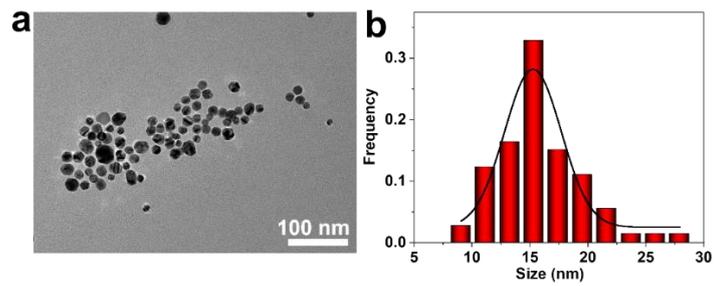
**Figure S3.** UV-vis absorption spectra of AgNO<sub>3</sub> solution irradiated by laser.



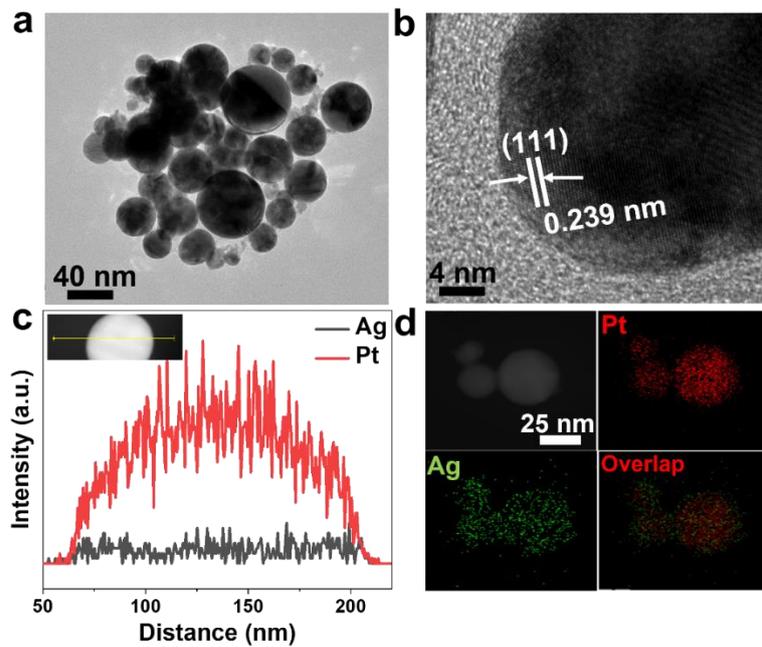
**Figure S4.** UV-vis absorption spectra of AgNO<sub>3</sub> solution irradiated by a 300W Xenon lamp with a wavelength of 520 nm .



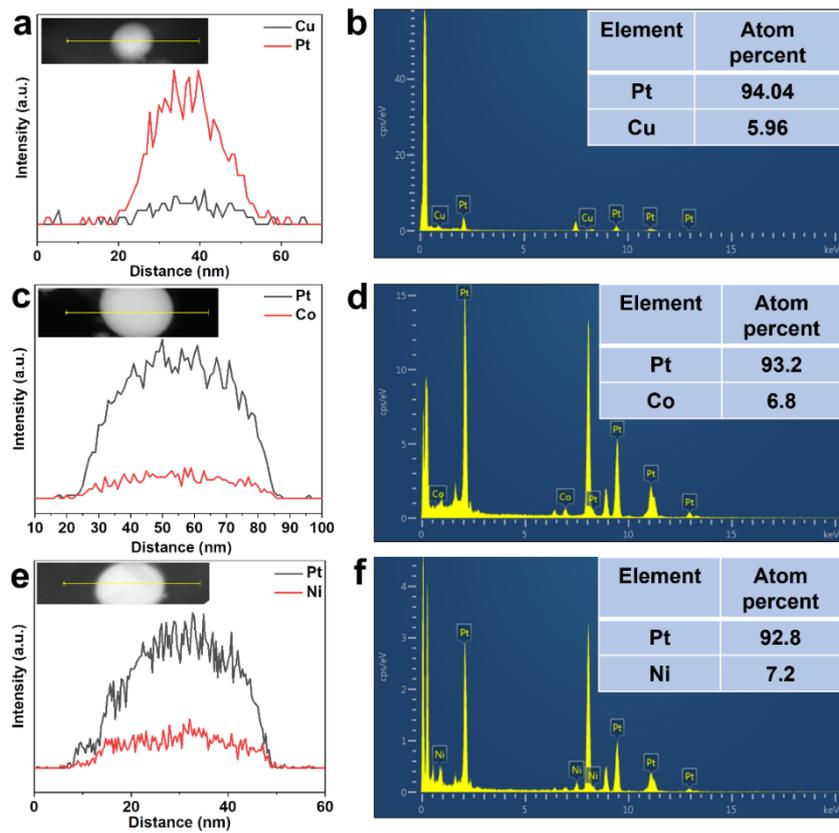
**Figure S5.** The pH of  $\text{AgNO}_3$  solution (125mg/L) (a) initial (b) after 5 min of laser irradiation. The pH of the intermixture of bulk Pt and  $\text{AgNO}_3$  solution (125mg/L) (c) initial (d) after 5 min of laser irradiation.



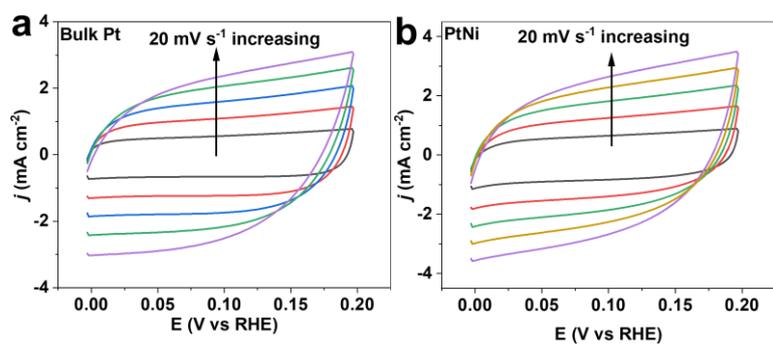
**Figure S6.** TEM images and histogram of size distribution of Ag NPs.



**Figure S7.** (a) TEM image of PtAg alloy NPs, (b) the HRTEM image of PtAg alloy NPs, (c-d) EDX line scans and EDS mapping of PtAg alloy NPs.



**Figure S8.** EDX line scans and EDX energy spectrum of PtX (X=Cu, Co, Ni) alloy NMs, **(a-b)** PtCu alloys, **(c-d)** PtCo alloys, **(e-f)** PtNi alloys.



**Figure S9.** Cyclic voltammetry curves at scan rates ranging from 20 to 100 mV s<sup>-1</sup> for (a) the bulk Pt, (b) PtNi alloy.