Electronic Supplementary Material for PCCP


# Formation of Au–Pt bimetallic nanoparticles in a two-layer $SiO_2$ films doped with Au and Pt respectively through interlayer diffusion

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## Electronic supplementary Information (ESI):

**Synthesis of inorganic-organic hybrid sol:**

Before metal ion doping the undoped inorganic-organic hybrid sol was prepared using TEOS, GLYMO, *n*-butanol, methanol, water, hydrochloric acid (HCl) and Aluminum acetylacetonate ($Al(acac)_3$). A catalytic amount of acid (HCl) and $Al(acac)_3$ were used for alkoxide hydrolysis and epoxy polymerization initiator respectively. First TEOS (21.5 mmol) and GLYMO (9.2 mmol) were dissolved in *n*-butanol (65 wt% of the total amount) in a beaker and stirred for 30 min at room temperature (25 °C ± 1). Then a mixture of acid (HCl; 5 x $10^{-4}$ mol per mol of alkoxy group), water (0.5 mol per mol of alkoxy group) and methanol were added to the above solution in stirring condition. The stirring was continued for another 30 min after which a clear and homogeneous solution was obtained. Then the resultant solution was refluxed for 60 min in a round-bottom flask and cooled down. $Al(acac)_3$ (0.05 mol per mol of GLYMO) was added to the refluxed solution in stirring condition and the stirring continued till it dissolved in the sol completely. The remaining amount of *n*-butanol (35%) was then added with stirring and the stirring was continued for another 30 min. The resultant clear sol was then used for Au and Pt doping and described in the paper.

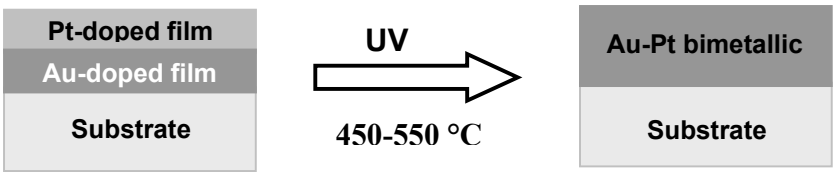


**Figure S1** Schematic representation of the two-layer (2L) film assembly before and after UV/thermal treatments

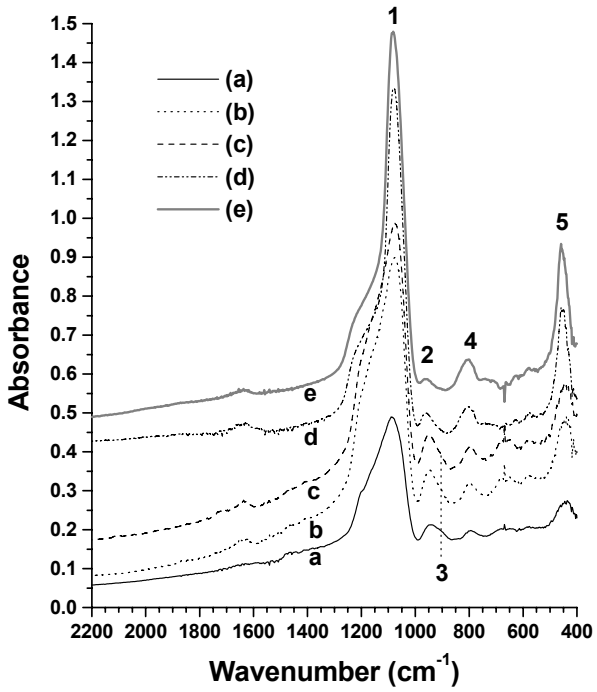


**Figure S2.** FTIR spectral evolution after deposition of (a) Au-doped film (first layer) dried at 60 °C, (b) Pt-doped film onto the first layer and dried at 60 °C, (c) after UV-treatment of 2L film, and subsequent heat-treated TL film in air: (d) 450 °C and (e) 550 °C for 1 h. Films were deposited on double side polished (intrinsic, IR transparent) Si wafers.

*Peak assignments:*

1 Si-O-Si asymmetric stretch

2 Si-OH stretch

3 Epoxide ring vibration

4 Si-O-Si symmetric stretch

5 Si-O-Si symmetric stretch

The FTIR spectral evolution shows complete decomposition of organics during UV- and heat-treatments. The final heat-treated film has peaks corresponding to $SiO_2$ only.