



Supplementary Figure 1 | Detection of hydrogen adsorption on Pt single-crystal surface. SHINERS spectra of hydrogen adsorbed on Pt(111) at -1.2 V **(a)**, at -1.6 V **(b)**, at -1.9 V **(c)**, without Au@SiO₂ NPs at -1.9 V **(d)**, and with the thicker-shell NPs at -1.9 V **(e)**.