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Electronic Supplementary Information

Pyrophosphate effect on the photocatalytic degradation of phenol over bare and Pt-deposited Bi_2WO_6

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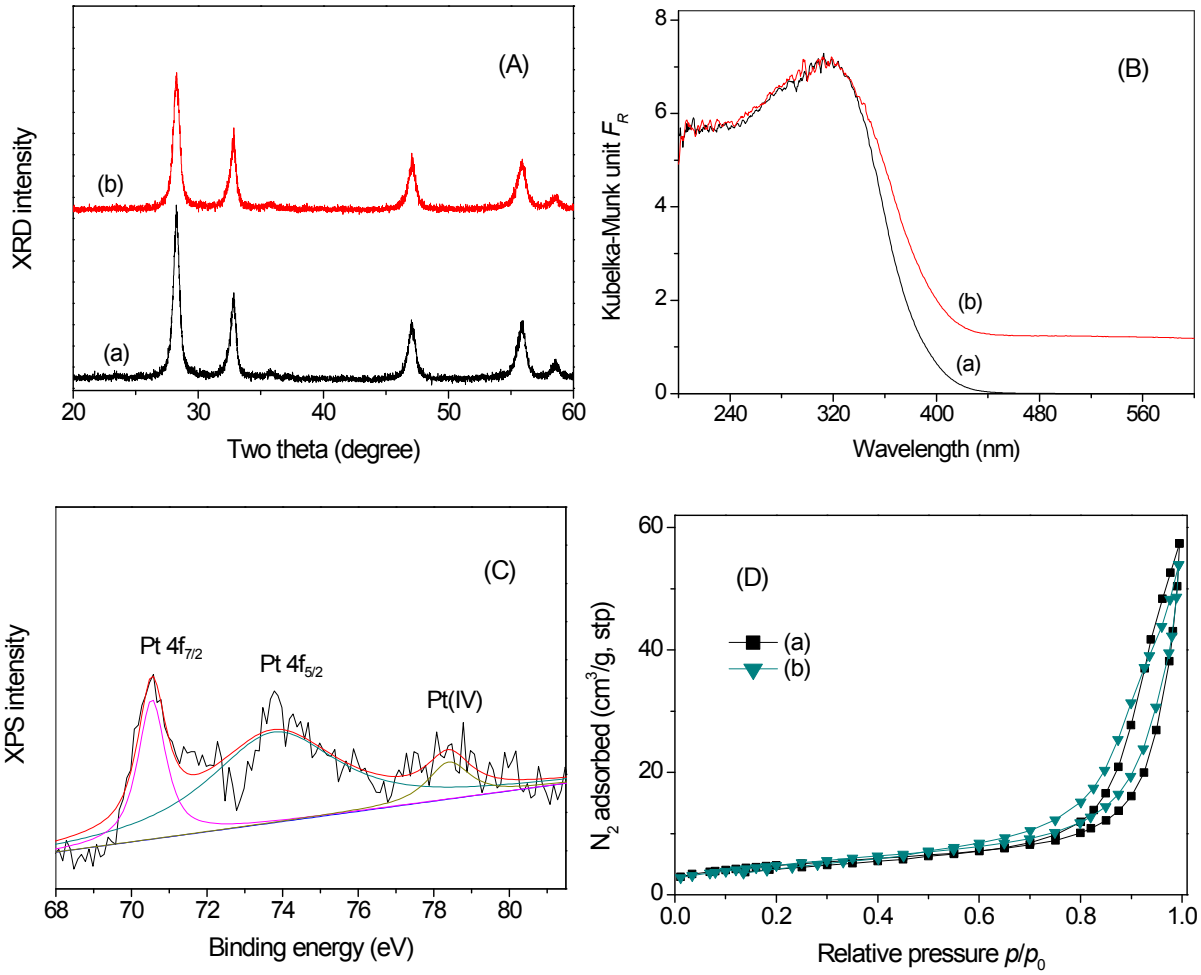

Fig. S1 (A) XRD patterns, and (B) absorption spectra of (a) BiW, and (b) Pt/BiW. (C) Pt 4f XPS spectra of Pt/BiW. (D) Adsorption–desorption isotherms of N_2 at 77 K measured on (a) BiW, and (b) Pt/BiW.

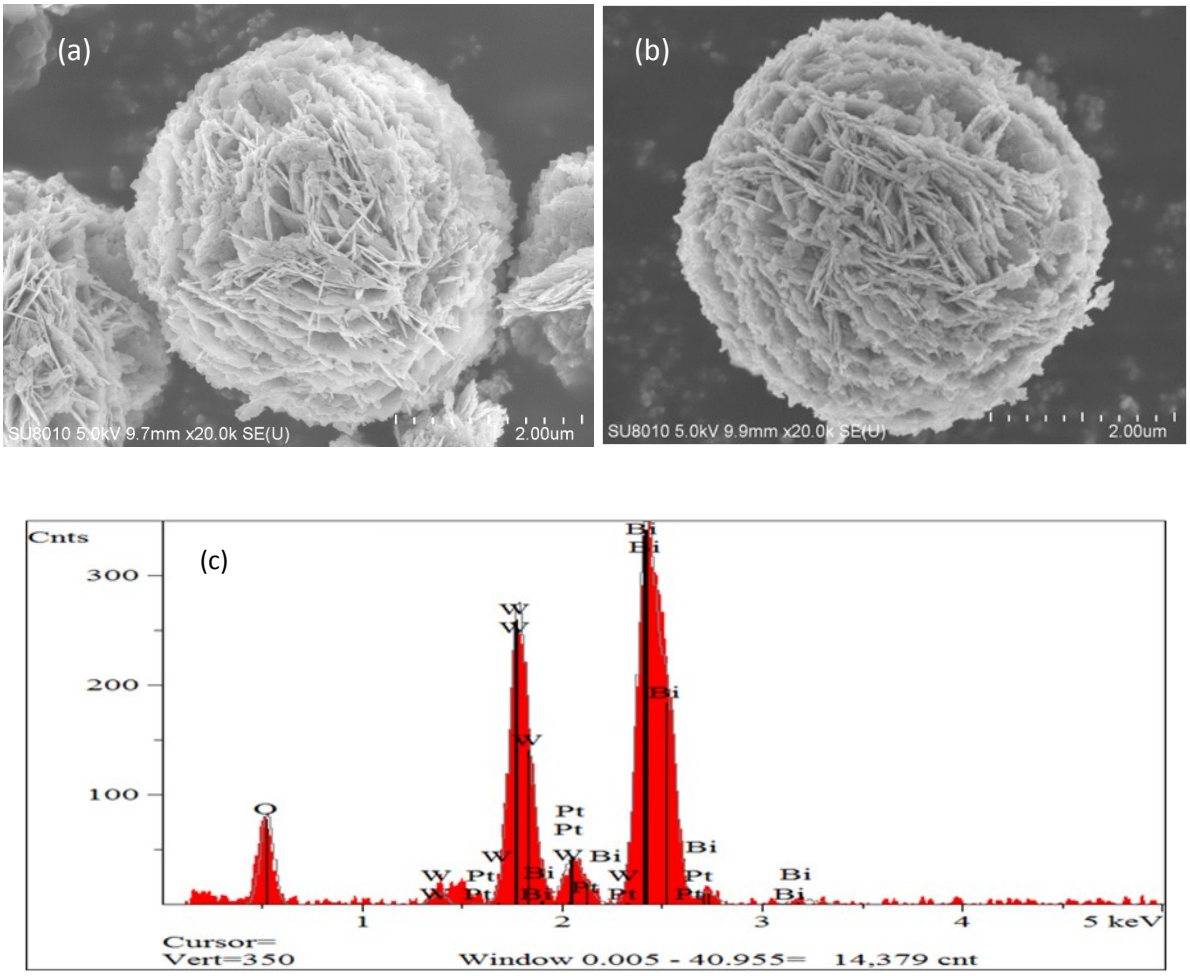

Fig. S2 SEM images of (a) BiW and (b) 0.5 wt% Pt/BiW. (c) Elemental analysis of 5 wt% Pt/BiW.

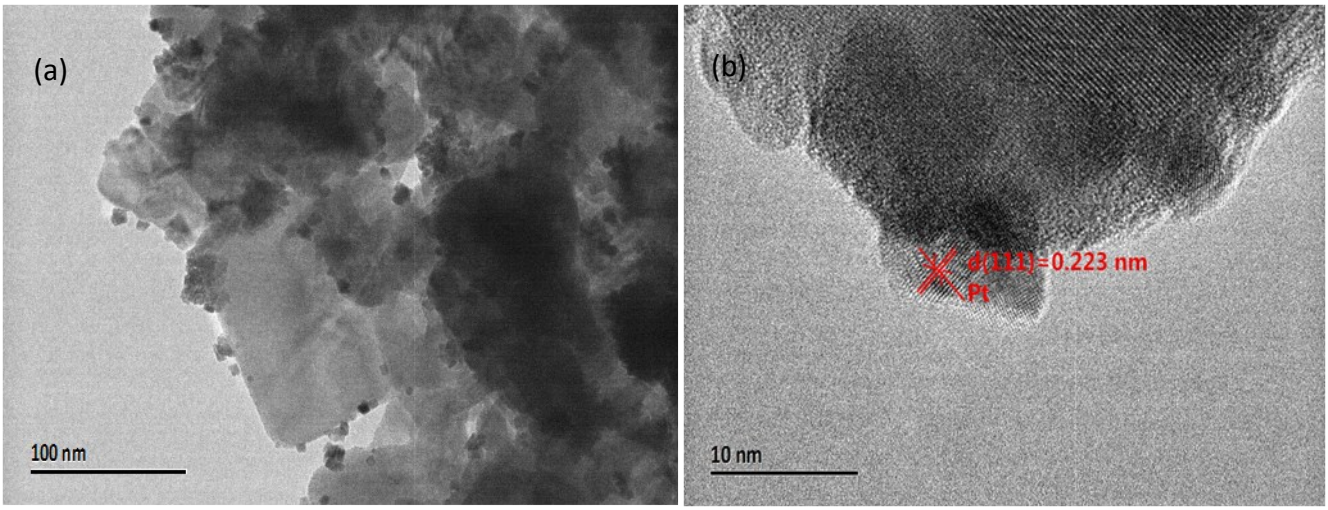

Fig. S3 HRTEM images for 5 wt % Pt/BiW.

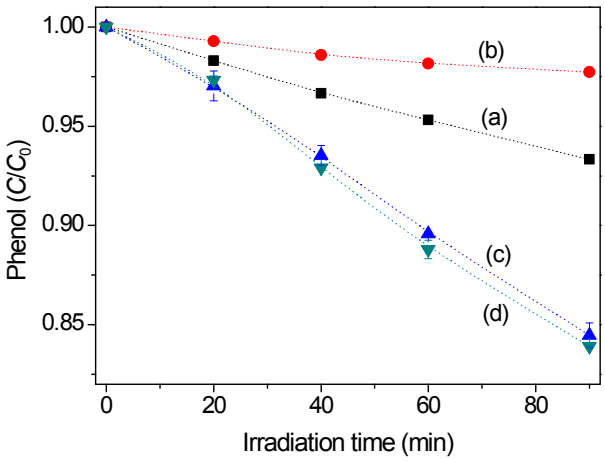

Fig. S4 Phenol degradation in aqueous solution at initial pH 9 under visible light, measured in the presence of (a) BiW, (b) BiW + $Na_2P_2O_7$, (c) Pt/BiWO, (d) Pt/BiW + $Na_2P_2O_7$.

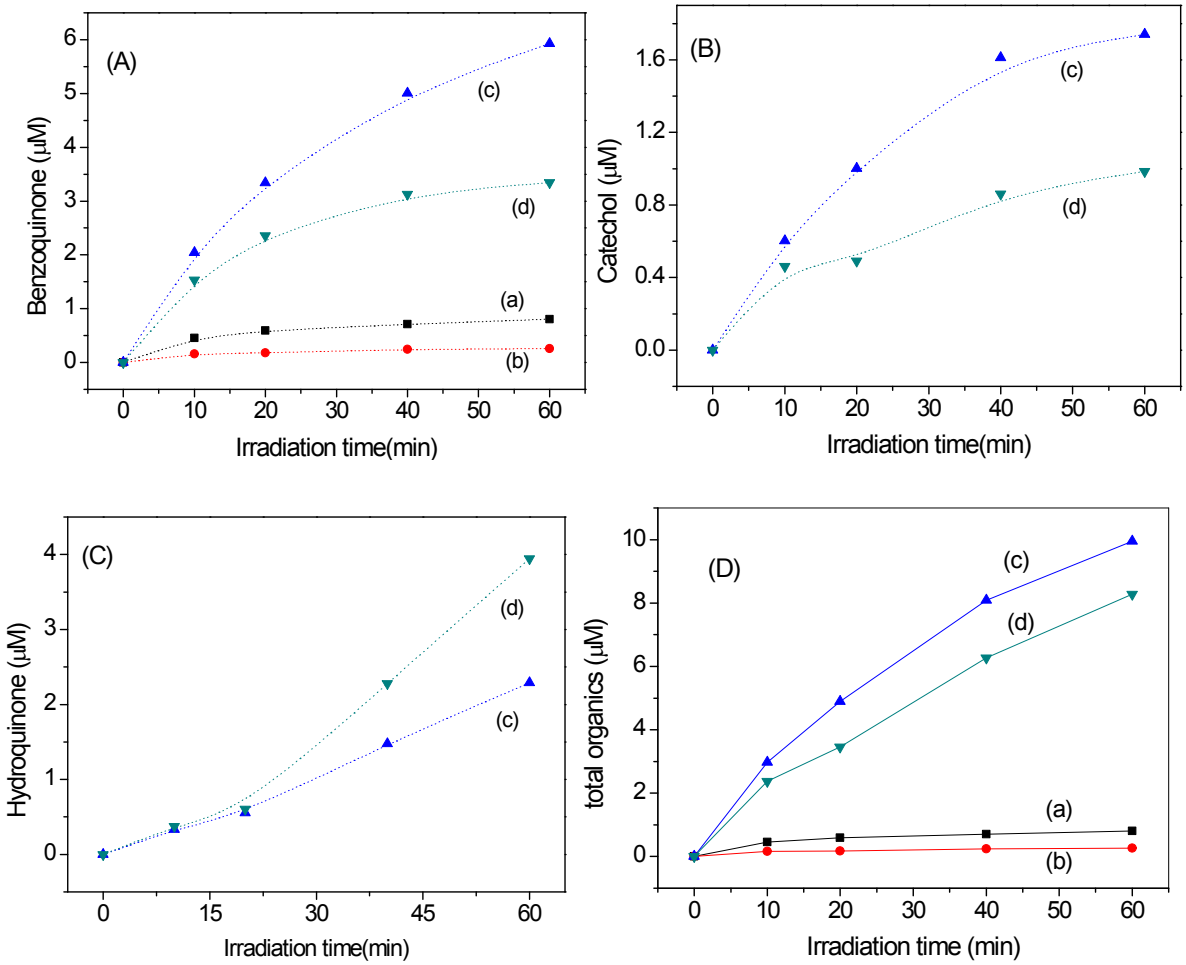

Fig. S5 The corresponding formation of (A) benzoquinone (BQ), (B) catechol (CA), (C) hydroquinone (HQ), and (D) total organics in aqueous solution for phenol degradation in Fig. 1A, measured under UV light in the presence of (a) BiW, (b) BiW + $Na_2P_2O_7$, (c) Pt/BiW, (d) Pt/BiW + $Na_2P_2O_7$.

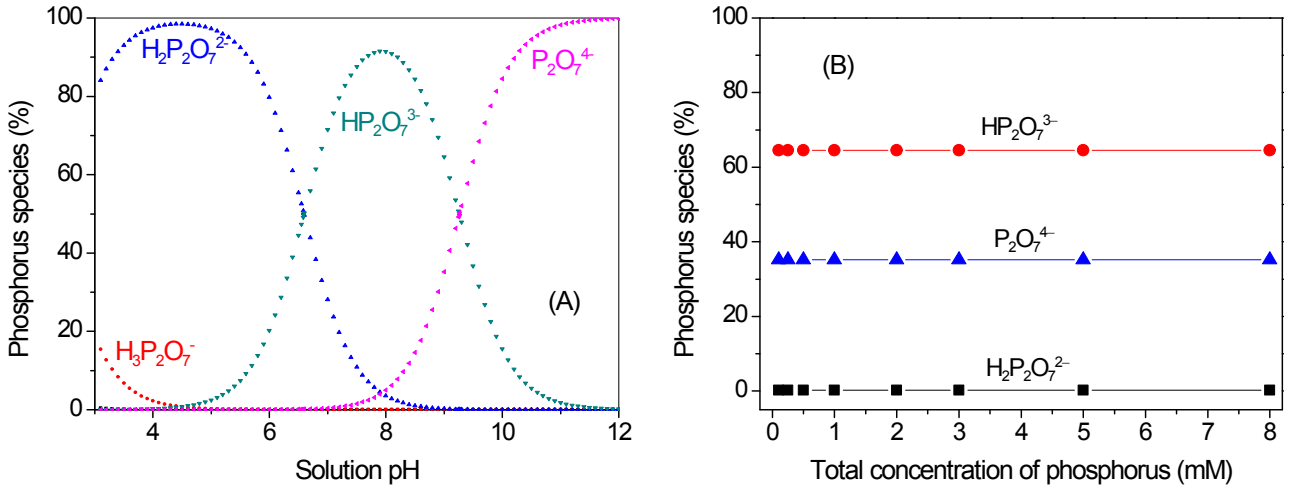

Fig. S6 The distribution of phosphorus species in aqueous solution as a function of (A) solution pH at 0.50 mM pyrophosphate, and of (B) total pyrophosphate concentration at pH 9.0. The dissociation constants of $H_4P_2O_7$ used here were pK_{a1} 1.52, pK_{a2} 2.36, pK_{a3} 6.60, and pK_{a4} 9.25, respectively (R. P. Mitra, H. C. Malhotra, D. V. S. Jain, Trans. Faraday Soc., 1966, 62, 167).

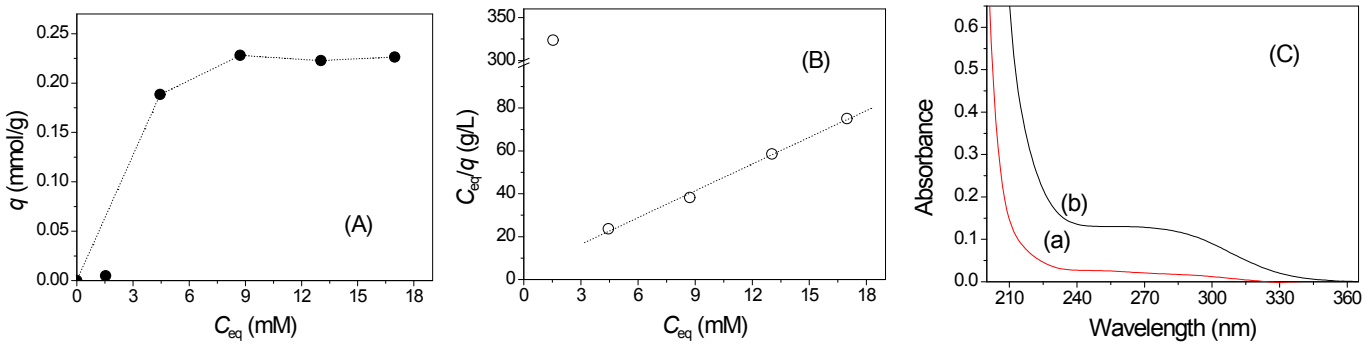

Fig. S7 (A) The amount of pyrophosphate adsorbed (q_e) on Pt/BiW at the equilibrium concentration in aqueous solution (C_{eq}) at pH 9.0. (B) Fitting to Langmuir adsorption equation, $q/q_{max} = KC_{eq}/(1 + KC_{eq})$, where qmax and K represent the maximum amount of adsorption, and adsorption constant, respectively. Note that first data was not used. (C) Absorption spectra of (a) 8 mM, and (b) 50 mM $Na_4P_2O_7$ at pH 9.0.

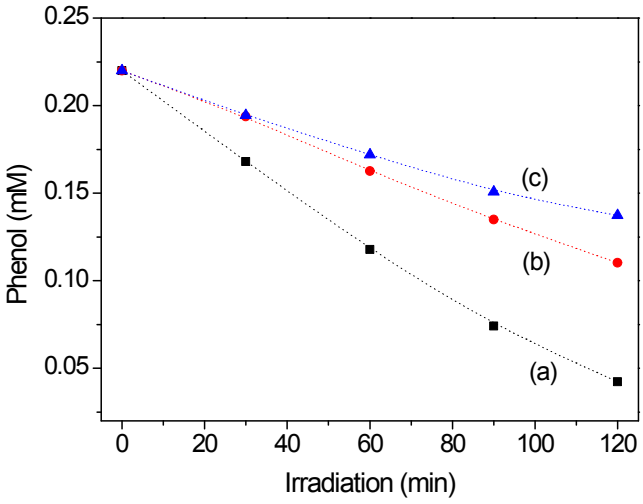

Fig. S8 Homogeneous degradation of phenol under UV light ($\lambda \geq 240$ nm) in aqueous solution at pH 9.0, measured with (a) 0.1 M H_2O_2, (b) 0.1 M H_2O_2 + 10 mM $Na_4P_2O_7$ and (c) 0.1 M H_2O_2 + 30 mM $Na_4P_2O_7$.