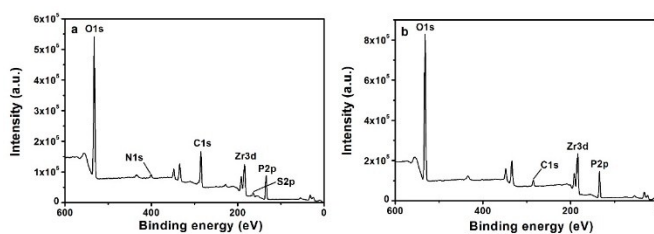
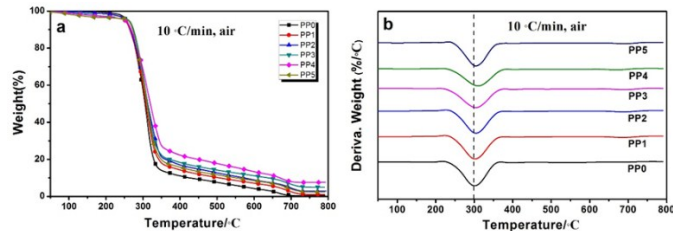


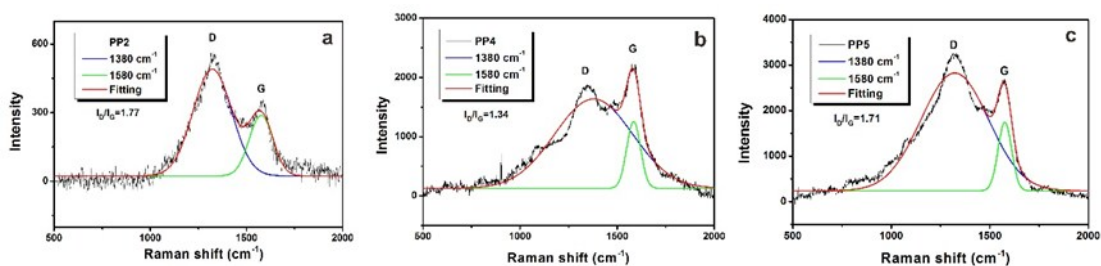
ESI 1 FTIR spectra of  $\alpha$ -ZrP and FZ flame retardant particles.



ESI 2 XPS spectra of FZ heating at 400 °C (a), 700 °C (b) for 5 min in muffle furnace.



ESI 3 TGA and DTG curves of PP0, PP1, PP2, PP3, PP4, and PP5 under air atmosphere.



ESI 4 Raman spectra of the char residues after the LOI test of (a) PP2, (b) PP4 and (c) PP5.