Supplementary information

2 Experimental Section

2.1 Materials

Cerium chloride (AR, ≥99.9%) was received from Xiya Chemical Technology Co. Ltd. (Shandong, China). Ammonium polyphosphate (form II, degree of polymerization: ≥1000) was obtained from Changfeng Chemical Co. Ltd. (Sichuan, China). ABS resin (GN-II) was purchased from China National Petroleum Co. Ltd. (Jilin, China). Anhydrous ethanol (AR, ≥99.7 %) was provided by Sinopharm Group chemical reagents Co. Ltd. (Shanghai, China).

2.2 Characterization

X-ray diffraction using a Smart Lab 3KW instrument with Cu Kα radiation (λ = 0.154) at the scan rate 10 °/min under scan range 10-60°. X-ray photoelectron spectroscopy was performed on an ESCALAB Xi+ electron spectrometer (Thermo Fisher Scientific, US) using 300 W Al Kα radiation. Ce and P contents were tested by inductively coupled plasma-atomic emission spectrometry (USA). Surface morphology and elemental analysis were characterised by scanning electron microscopy (JSM-6390LV, Nippon Electron, Japan) and energy dispersive X-ray spectroscopy. Thermogravimetric testing was performed on TA 5500 under the nitrogen atmosphere at 25 °C/min during 40-750 °C. The limiting oxygen index and the UL-94 vertical burning level test were performed using TTech-GBT2406 oxygen index meter and TTech-GBT2408 instrument (TTech., China), respectively. An evaluation of the combustion behaviour of samples with dimensions of 100 mm × 100 mm × 3 mm in a cone calorimeter with a heat flux of 30 kW/m^2 (Fire Testing Technology, UK). Laser Raman spectroscopy data were collected by a SPEX-

1403 laser Raman spectrometer with 514.5 nm argon laser. Thermogravimetric-Fourier Transform Infrared Spectroscopy consists of a TG 209 F1 (NETZSCH, Germany) and a 170 SX FTIR spectrometer (Nicolet, USA). Tensile and flexural properties were tested with an INSTRON 5967 Tester (Instron., USA) at 20 mm/min according to ASTM D638 and ASTM D790, respectively.

Table S1 TGA date of ABS composites in N_2 atmosphere

Sample	$T_{5\%}$ (℃)	R_{max} (%/min)	T_{max} (℃)	W_{750} (wt%)
APP	323.6	-	325.2	31.6
Ce@APP	320.2	-	320.2	33.4
ABS1	400.0	-2.2	443.2	0.36
ABS2	385.1	-1.6	443.3	10.3
ABS3	328.6	-1.6	441.6	10.3
ABS6	330.2	-1.6	443.3	12.5

$T_{5\%}$: The temperature where 5 wt% of weight was lost;

R_{max}: The maximum weight loss rate;

T_{max}: The temperature where the maximum weight loss occurs;

W_{750}: The residual weight at 750 °C.