Flame retardation behavior of polybenzoxazine/α-ZrP nanocomposites

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Supporting Information

Thermogravimetric analysis (TG) was used to calculate the amount of real α-ZrP nanosheets in exfoliated α-ZrP gel. TG was carried out at a heating rate of 10 °C/min and a flow rate of 60 mL/min under nitrogen and held at 900 °C for 60min.

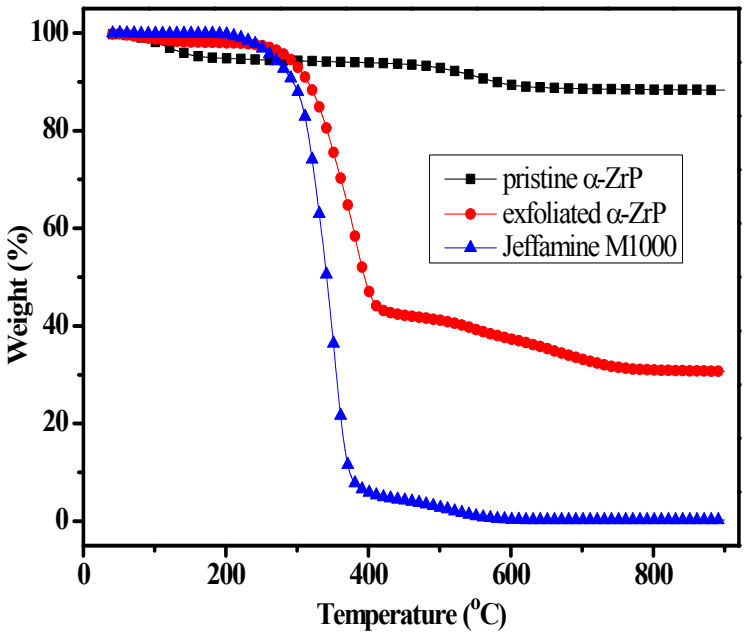

Fig.S1 TG curves of pristine α-ZrP, exfoliated α-ZrP and Jeffamine M1000 in nitrogen.

Jeffamine and α-ZrP nanosheets were thermal degraded completely under the above condition. The residues amount of pristine α-ZrP, Jeffamine and exfoliated α-ZrP gel were 88.3%, 0.2% and 30.7%, respectively (Table S2). The pristine α-ZrP was unexfoliated α-ZrP. The real exfoliated α-ZrP nanoplatelets could be calculated through the followed equation.

$$\frac{88.3\%}{100\%} = \frac{30.7\% - 0.2\%}{x}$$

x is the weight ratio of real α-ZrP nanoplatelets in per 100 g exfoliated α-ZrP gel. The x was calculated to be 34.5%. So, Jeffamine in exfoliated α-ZrP gel was 65.5% (1-34.5%). Then, the weight ratio of α-ZrP to Jeffamine M1000 in exfoliated α-ZrP gel was calculated to be 0.53 to 1 (34.5%:65.5%).

Table S1 Residuals of samples at 900 °C from TG curves

Sample	Residuals at 900°C (%)
Pristine α-ZrP	88.3
Exfoliated α-ZrP	30.7
Jeffamine-M1000	0.2

Table S2 Thermal parameters of PBa and its nanocomposites.

Samples	$T_{initial}$ (°C)		T_{max} (°C)		Char Residual at 700°C	
	Air	N_2	Air	N_2	Air	N_2
Pristine PBa	337	325	623	384	0.5	34.6
PBa/α-ZrP-2.8%	348	333	625	379	3.1	51.4
PBa/α-ZrP-4.6%	347	336	632	386	4.0	54.1
PBa/α-ZrP-8.4%	348	335	631	384	5.8	54.0
PBa/M1000-15.9%	291	295	346,613	350	0.6	34.0