Supporting Information

Silicon/nitrogen synergistically reinforced flame-retardant PA6 nanocomposites with simultaneously improved anti-dripping and mechanical properties

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Table S1 DSC, TGA and XRD results of PA6, FR-PA6, PA6/MCA and FR-PA6/MCA nanocomposites

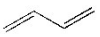
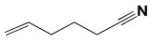
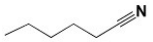
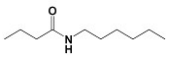
Sample	T_g(°C)	T_m(°C)	$T_{5\%}$ (°C)	T_{max1} (°C)	T_{max2} (°C)	Char residues (wt %)	X_c (%)
PA6	49	220	387	-	469	0.5	37.8
FR-PA6-6	49	210	389	-	466	1.6	46.7
FR-PA6-9	50	200	387	-	462	2.7	38.4
FR-PA6-12	48	189	390	-	468	3.8	35.3
FR-PA6-9/MCA-6	48	200	331	348	465	4.3	41.6
FR-PA6-9/MCA-8	47	200	334	348	465	3.2	45.6
FR-PA6-9/MCA-10	47	200	331	348	474	2.8	47.8
PA6/MCA-8	48	220	327	347	463	0.1	43.2
FR-PA6-6/MCA-8	48	210	336	348	463	1.0	54.5
FR-PA6-12/MCA-8	47	189	322	348	453	3.7	35.0

Table S2. Summary of tensile properties of PA6 and FR-PA6

Samples	σ (MPa)[a]	Yield point stress (MPa)	ε (%)[b]	E (MPa)[c]
PA6	64.4±0.2	67.6±0.3	88±1.2	887±2.5
FR-PA6-6	88.6±0.3	66.7±0.2	326±2.6	930±2.6
FR-PA6-9	83.5±0.1	58.7±0.2	368±3.2	893±2.8
FR-PA6-12	62.4±0.2	46.5±0.1	470±2.2	713±2.0

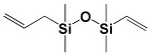
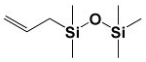
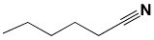
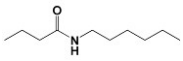
[a] Tensile stress, [b] Elongation at break, [c] Young's modulus

Table S3. Possible structural assignments of PA6 decomposed under 700 °C

R. Time (min)	m/z	Area%	Gas Compound[a]
1.44	44	8.97	CO_2
1.56	54	6.91	
1.75	70	1.35	
1.83	41	1.64	
1.97	66	2.86	
5.53	84	0.25	
6.76	95	0.62	
6.98	97	0.76	
12.70	113	71.01	
16.54	171	0.26	

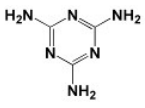
[a] Data from NIST11s.library.

Table S4. Possible structural assignments of FR-PA6-9 decomposed under 700 °C

R.Time (min)	m/z	Area%	Gas Compound[a]
1.44	44	37.02	CO_2
1.85	41	2.07	
1.99	66	2.97	
2.19	90	1.07	
4.67	200	0.27	
5.53	84	1.96	
6.29	188	0.25	
6.82	95	0.89	
7.04	97	0.94	
12.38	113	41.66	
16.54	171	0.87	

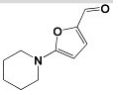
[a] Data from NIST11s.library.

Table S5. Possible structural assignments of MCA decomposed at 700 °C

R.Time (min)	*m/z*	Area%	Gas Compound[a]
1.44	44	12.30	CO_2
1.82	43	15.45	
16.27	126	36.96	
20.48	126	35.29	

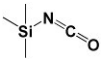
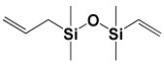
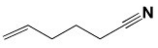
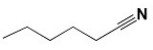
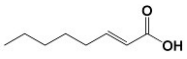
[a] Data from NIST11s.library.

Table S6. Possible structural assignments of FR-PA6-9/MCA-10 decomposed under 350 °C

R.Time (min)	m/z	Area%	Gas Compound[a]
2.40	43	19.03	
12.49	113	51.8	
16.59	126	19.99	
17.07	170	1.14	
23.97	388	0.76	

[a] Data from NIST11s.library.

Table S7. Possible structural assignments of FR-PA6-9/MCA-10 decomposed under 700 °C

R.Time (min)	m/z	Area%	Gas Compound[a]
1.44	44	6.97	CO_2
1.76	70	0.98	
2.04	68	1.25	
2.88	115	0.27	
4.33	200	0.19	
5.46	222	3.93	
6.81	95	3.79	
7.03	97	1.39	
12.71	113	75.63	
18.26	142	2.92	

[a] Data from NIST11s.library.

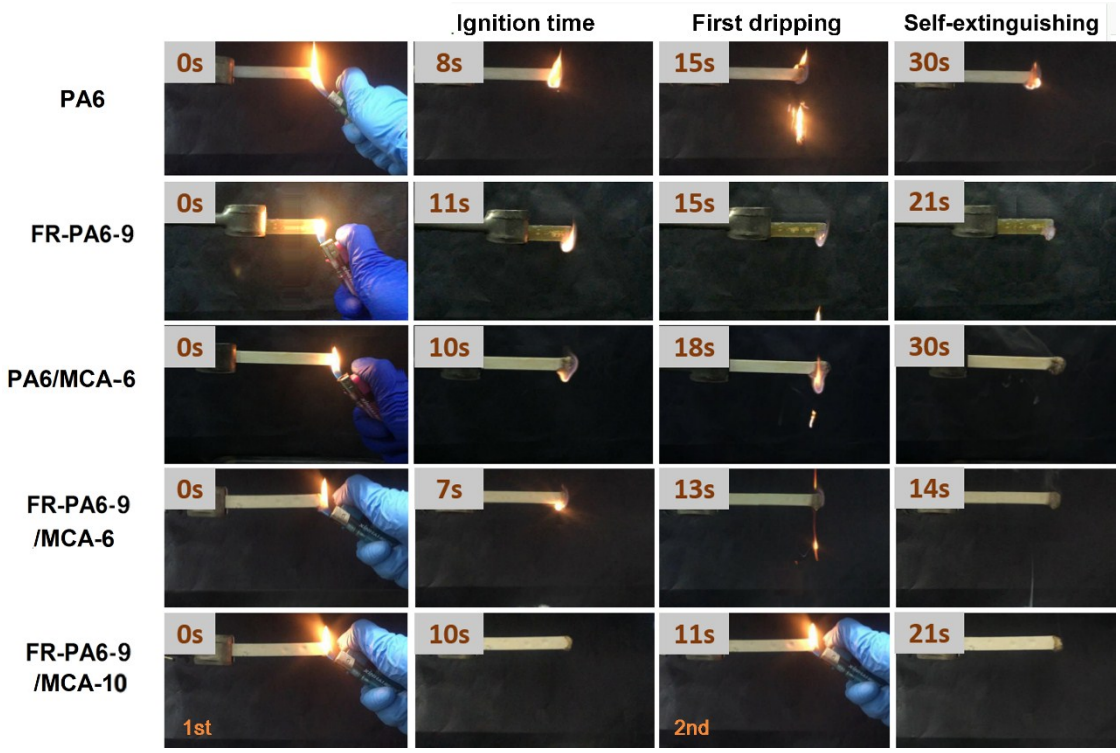


Fig.S1 Real-time combustion of PA6, FR-PA6, PA6/MCA and FR-PA6-9/MCA in air atmosphere