

Supporting information

Synthesis and Combustion Performance Investigation of Fe₂O₃-containing Nanothermites via Ball Milling Method

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Section 1. SEM image and contact angle of Fe_2O_3 nanoparticles.

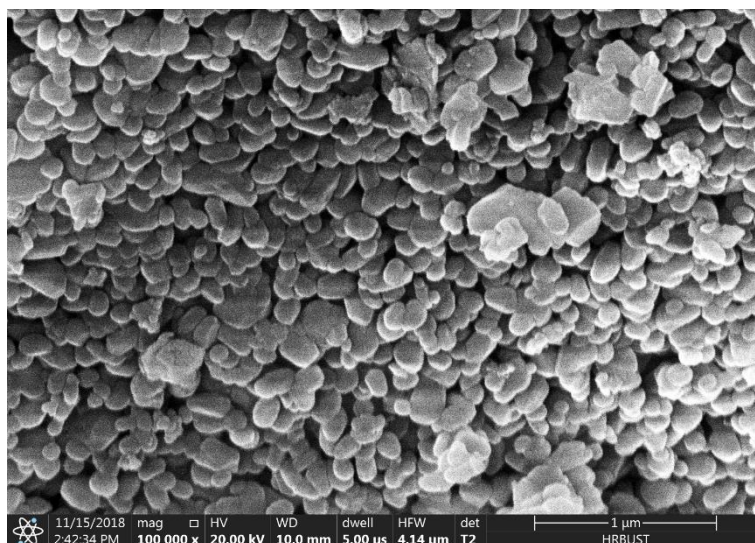


Figure S1. SEM image of Fe_2O_3 nanoparticles.



Figure S2. Contact angle of Fe_2O_3 nanoparticles.

Section 2. TGA fitting curves of nanothermites prepared by in-situ ball milling and ultrasonic blending method.

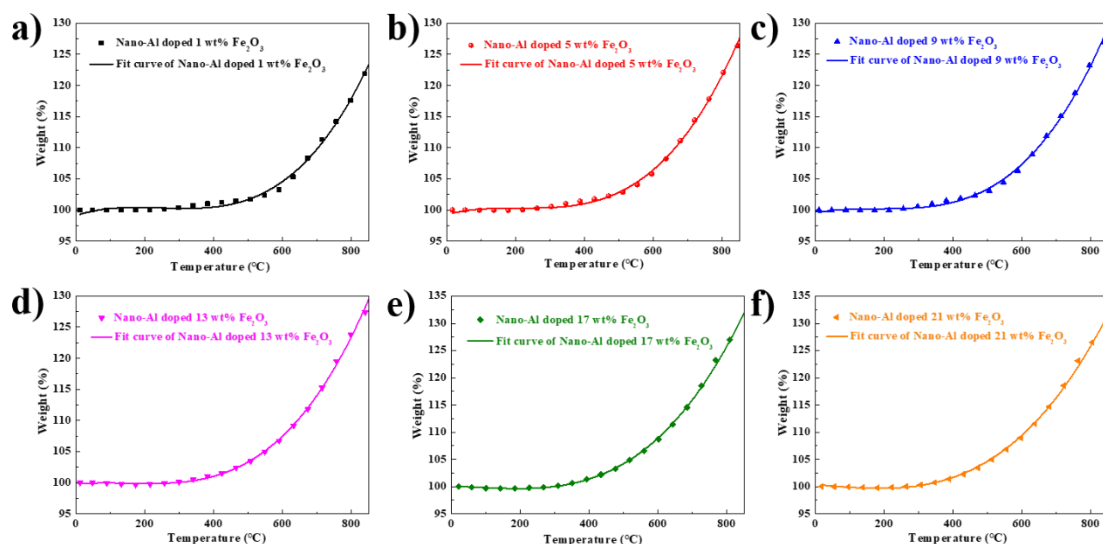


Figure S3. TGA fitting curves of nanothermites prepared by in-situ ball milling method, (a) nano-Al doped 1 wt% Fe_2O_3 ; (b) nano-Al doped 5 wt% Fe_2O_3 ; (c) nano-Al doped 9 wt% Fe_2O_3 ; (d) nano-Al doped 13 wt% Fe_2O_3 ; (e) nano-Al doped 17 wt% Fe_2O_3 ; (f) nano-Al doped 21 wt% Fe_2O_3 .

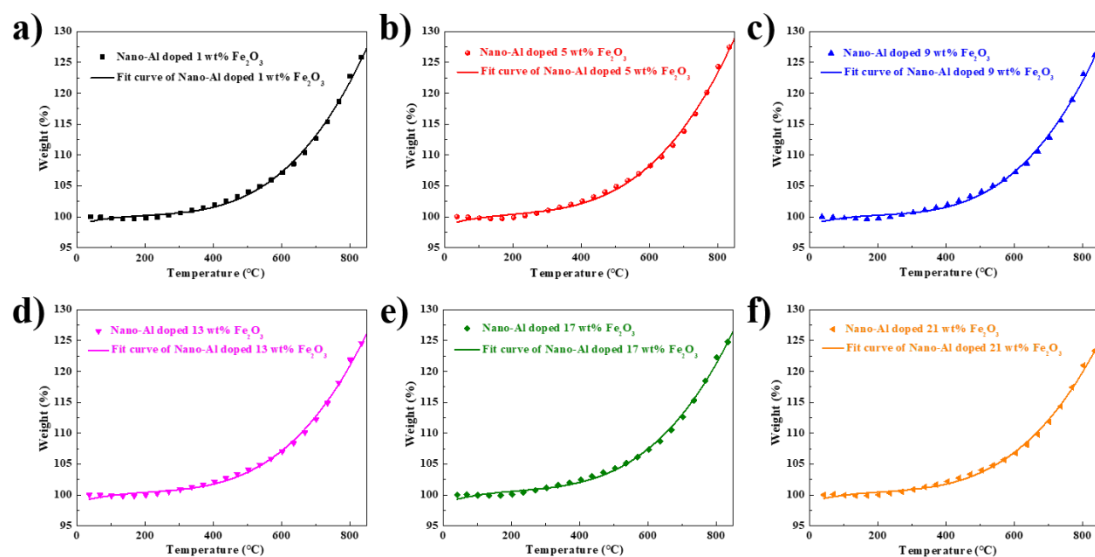


Figure S4. TGA fitting curves of nanothermites prepared by ultrasonic blending method, (a) nano-Al doped 1 wt% Fe_2O_3 ; (b) nano-Al doped 5 wt% Fe_2O_3 ; (c) nano-Al doped 9 wt% Fe_2O_3 ; (d) nano-Al doped 13 wt% Fe_2O_3 ; (e) nano-Al doped 17 wt% Fe_2O_3 ; (f) nano-Al doped 21 wt% Fe_2O_3 .

Table S1. TGA fitting curves constants of nanothermites prepared by in-situ ball milling method.

$f(Bx) = B1 * x^3 + B2 * x^2 + B3 * x + \text{intercept}$				
Doped amount	B1	B2	B3	Intercept
1 wt%	$1.089*10^{-7}$	$-7.997*10^{-5}$	0.0179	99.118
5 wt%	$1.046*10^{-7}$	$-6.623*10^{-5}$	0.0141	99.287
9 wt%	$9.745*10^{-8}$	$-5.364*10^{-5}$	0.0101	99.530
13 wt%	$8.798*10^{-8}$	$-3.921*10^{-5}$	0.00478	99.761
17 wt%	$7.510*10^{-8}$	$-1.798*10^{-5}$	-0.00143	100.038
21 wt%	$6.213*10^{-8}$	$-3.476*10^{-6}$	-0.00526	100.365

Table S2. TGA fitting curves constants of nanothermites prepared by ultrasonic blending method.

$f(Sx) = S1 * x^3 + S2 * x^2 + S3 * x + \text{intercept}$				
Doped amount	S1	S2	S3	Intercept
1 wt%	$9.466*10^{-8}$	$-5.920*10^{-5}$	0.0157	98.704
5 wt%	$9.313*10^{-8}$	$-5.652*10^{-5}$	0.0165	98.603
9 wt%	$9.694*10^{-8}$	$-6.093*10^{-5}$	0.0160	98.709
13 wt%	$9.095*10^{-8}$	$-5.852*10^{-5}$	0.0163	98.746
17 wt%	$9.221*10^{-8}$	$-6.109*10^{-5}$	0.0181	98.658
21 wt%	$8.499*10^{-8}$	$-5.396*10^{-6}$	0.0152	98.879

Table S3. Constants of TGA fitting curves derivatives of nanothermites prepared by in-situ ball milling method.

$\dot{f}(Bx) = B1' * x^2 + B2' * x + B3'$				
Doped amount	$B1'$	$B2'$	$B3'$	Weight gain percentage per 100 °C
1 wt%	$3.267*10^{-7}$	$-1.599*10^{-4}$	0.0179	11.8%
5 wt%	$3.138*10^{-7}$	$-1.325*10^{-4}$	0.0141	12.9%
9 wt%	$2.924*10^{-7}$	$-1.073*10^{-4}$	0.0101	13.0%
13 wt%	$2.639*10^{-7}$	$-7.842*10^{-5}$	0.00478	12.9%
17 wt%	$2.253*10^{-7}$	$-3.596*10^{-5}$	-0.00143	13.1%
21 wt%	$1.864*10^{-7}$	$-6.952*10^{-5}$	-0.00526	12.4%

Table S4. Constants of TGA fitting curves derivatives of nanothermites prepared by ultrasonic blending method.

$\dot{f}(Sx) = S1' * x^2 + S2' * x + S3'$				
Doped amount	$S1'$	$S2'$	$S3'$	Weight gain percentage per 100 °C
1 wt%	$2.840*10^{-7}$	$-1.184*10^{-4}$	0.0157	12.0%
5 wt%	$2.794*10^{-7}$	$-1.130*10^{-4}$	0.0165	12.2%
9 wt%	$2.908*10^{-7}$	$-1.219*10^{-4}$	0.0160	12.2%
13 wt%	$2.729*10^{-7}$	$-1.170*10^{-4}$	0.0163	11.4%
17 wt%	$2.766*10^{-7}$	$-1.222*10^{-4}$	0.0181	11.4%
21 wt%	$2.550*10^{-7}$	$-1.079*10^{-4}$	0.0152	10.8%