

Supplementary Materials

Effects of Graphite Oxide Nanoparticle Size on the Functional Properties of Layer-by-Layer Coated Flexible Foams

Lorenza Maddalena ¹, Julio Gomez ², Alberto Fina ¹ and Federico Carosio ^{1,*}

¹ Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Alessandria Campus, Viale Teresa Michel 5, 15121 Alessandria, Italy; lorenza.maddalena@polito.it (L.M.); alberto.fina@polito.it (A.F.)

² Avanzare Innovacion Tecnologica S.L, Avda. Lentiscares 4-6, Poligono Industrial Lentiscares, 26370 Navarrete, Spain; julio@avanzare.es

* Correspondence: federico.carosio@polito.it

Graphite oxide preparation and characterization

Water dispersion of graphite oxide was prepared using a modified Hummers' method in H₂SO₄. Starting from large flakes of natural graphite (NGS-Naturgraphit) and using a proportion of graphite/KMnO₄/NaNO₃ 1:3.75:0.25. The reaction temperature inside the reactor was kept between 0 and 4 °C during the oxidants addition (72 h). After that time, resulting solution was slowly warmed up to 20°C and maintained for 72 hours of reaction. To remove the excess of MnO₄⁻, H₂O₂ solution was added to the reaction mixture and stirred overnight. After sedimentation, the solution was washed with a mechanical stirred HCl 4 %wt solution by 2 h. The solid was filtered off obtaining wet graphite oxide. Wet graphite oxide was dispersed in deionized water (1 %wt based on dry graphene oxide) and stirred in a in a Dispermat LC75 using a cowless helix at 1000 rpms for 10 minutes and them at 20.000 rpms for 60 seconds. Then, this dispersion was ultrasonicated with a UP400S HIELCHER using a H22 sonotrode with 90% of amplitude and full cycle condition to exfoliate the graphite oxide for different times in order to obtain GO with different average lateral size: 30 min for GO_A, 60 min for GO_B and 120 min for GO_C. The pH of the suspensions was measured in the first 24h after its preparation with a calibrated pH meter.

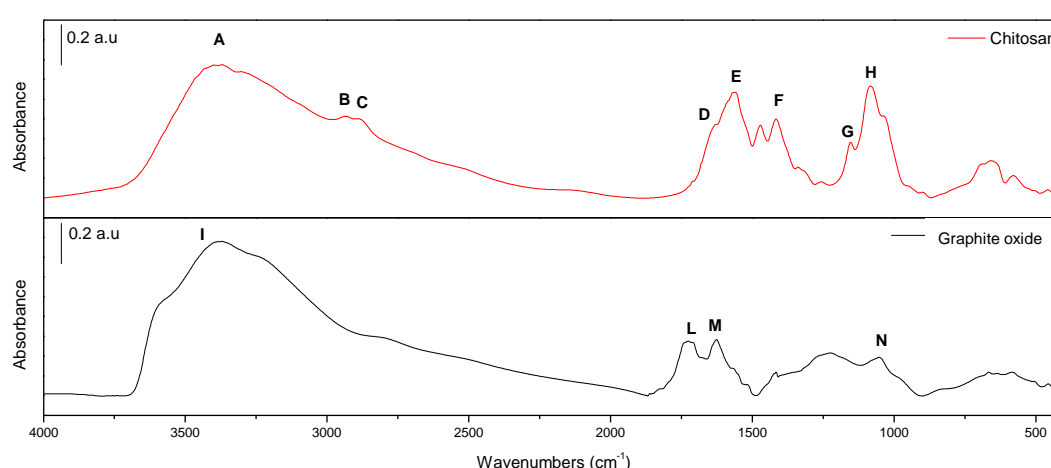


Figure S1. FTIR spectra of chitosan and GO_A signal attribution.

Table S1. Attribution of chitosan and graphite oxide FTIR signal.

	Signal	Wavenumbers (cm⁻¹)	Attribution
Chitosan	A	3800–3000	$\nu(\text{O-H})$ and $\nu(\text{N-H})$
	B	2900	$\nu_{\text{as}}(\text{C-H})$ of CH_2
	C	2880	$\nu_{\text{s}}(\text{C-H})$ of CH_2
	D	1640	$\delta_{\text{as}}(\text{NH}_3^+)$
	E	1556	$\delta_{\text{s}}(\text{NH}_3^+)$
	F	1156	NH_3^+ rocking
	G	1411	$\delta(\text{C-H})$ of CH_2
	H	1080	$\nu(\text{C-O-C})$ of glycosidic units
	I	3800–3000	$\nu(\text{O-H})$
Graphite Oxide	L	1725	$\nu(\text{C=O})$
	M	1627	$\nu(\text{O-C=O})$
	N	1054	$\nu(\text{C-O})$

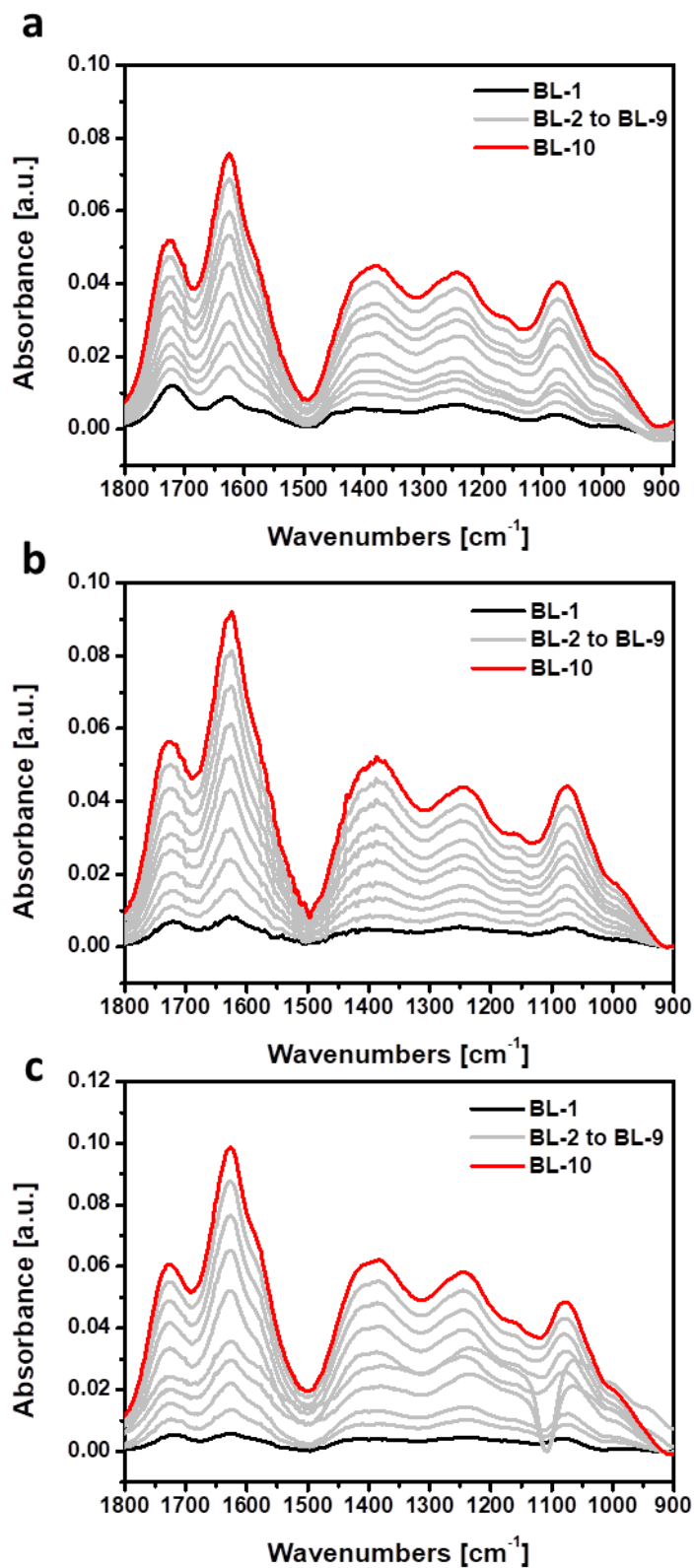


Figure S2. FTIR LbL growth of 10 BL CHIT/ GO_A (a), 10 BL CHIT/ GO_B (b) and 10 BL CHIT/ GO_C (c).

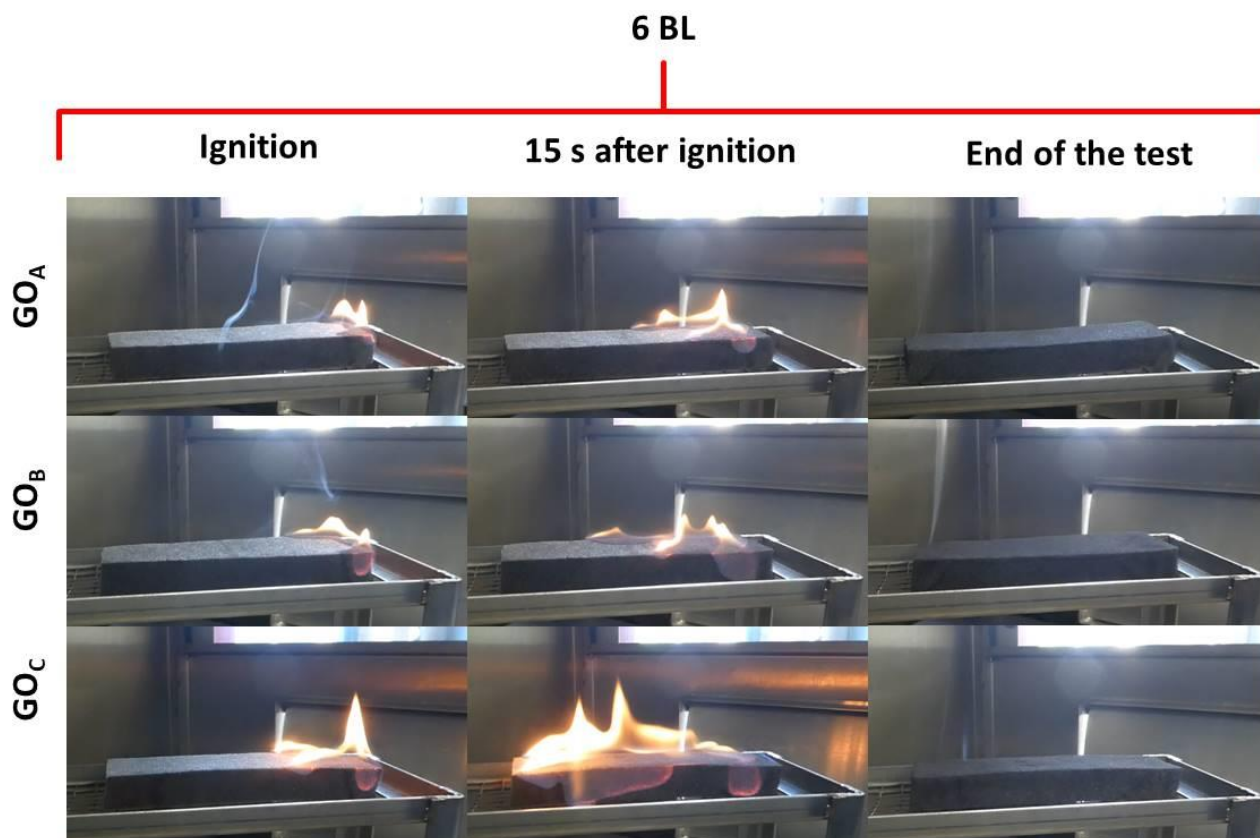


Figure S3. Pictures of flammability test in horizontal configuration of 6 BL CHIT/GO_A treated PU foam, 6 BL CHIT/GO_B PU foam and 6 BL CHIT/GO_C PU foam . First column: right after ignition, second column: 15 seconds after ignition and third column: end of the test.