

Surface Modification and Characterization of Waste Derived Carbon Particles to Reinforce Photo-Cured Shape Memory Composites

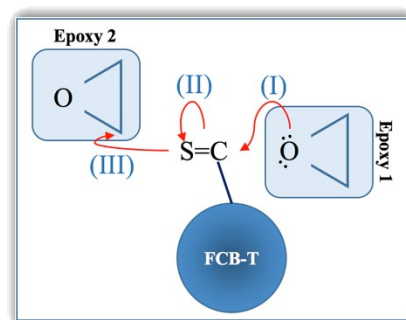
Muhammad Atif¹*, Muhammad Naeem¹, Ramzan Abdul Karim², Faiza Ameen³, Muhammad Waseem Mumtaaz⁴

¹ Department of Chemistry, University of Education Lahore, Vehari Campus, Punjab, Pakistan

² Faculty of Materials and Chemical Engineering, GIKI, Topi, Pakistan

³ Department of Chemistry, Bahauddin Zakarya University Multan, Punjab, Pakistan

⁴ Department of Chemistry, Faculty of Sciences, University of Gujrat, Punjab, Pakistan



Scheme S1: Reaction of carbonyl sulfide with epoxy

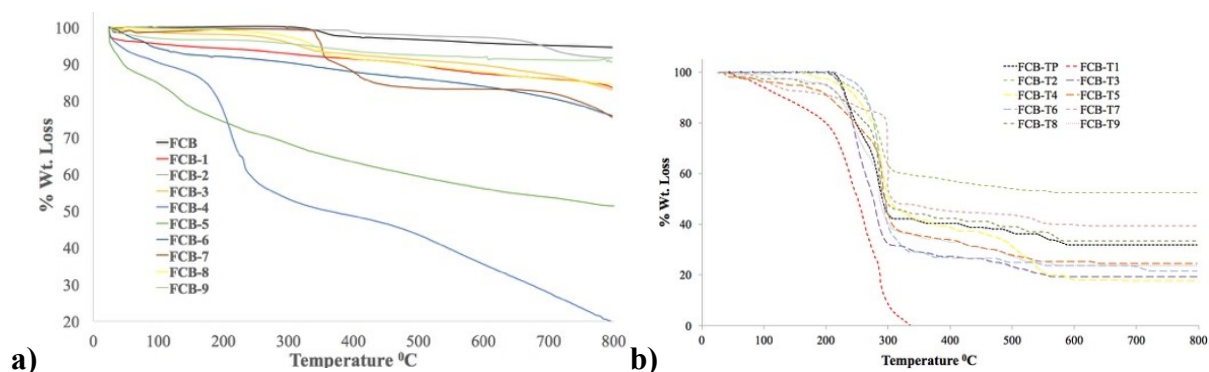


Figure S1: TGA of a) oxidized, b) thiolated FCB particles

* Dr. Muhammad Atif, Department of Chemistry,
University of Education Lahore, Vehari Campus, Punjab, Pakistan.
Contact: 0092-3024757979; 0092-3320947978
Email: muhammad.atif@ue.edu.pk; chemistatif@yahoo.com

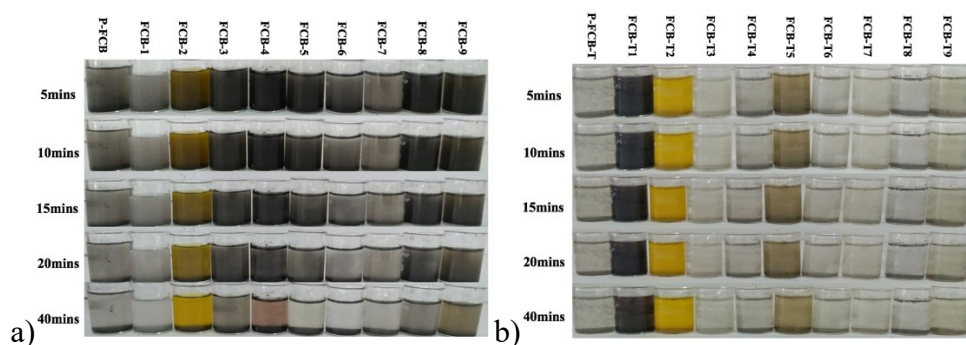


Figure S2: Water dispersion of a) unmodified and oxidized FCB, b) FCB-T particles

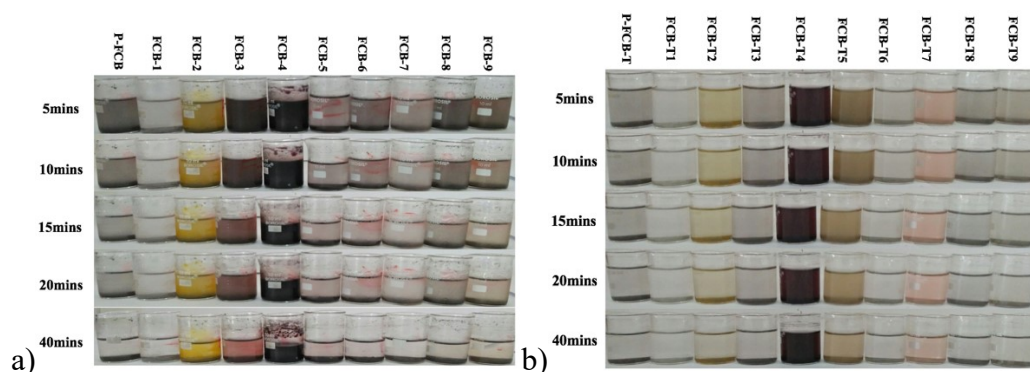


Figure S3: Acetone dispersion of a) unmodified and oxidized FCB, b) FCB-T particles

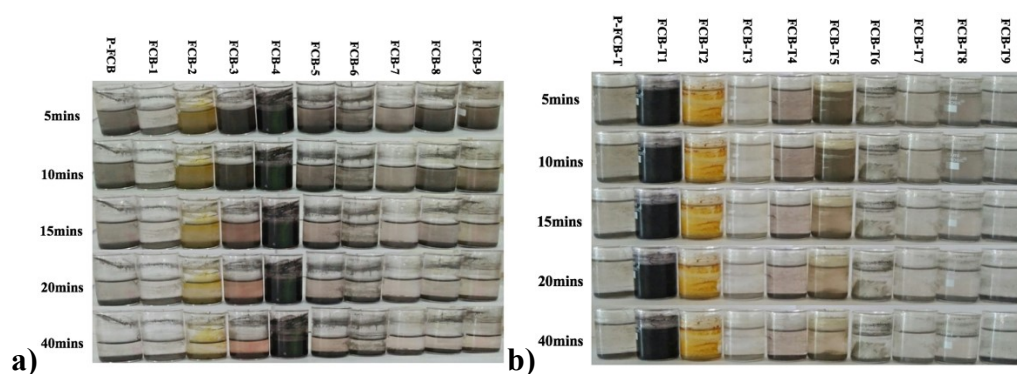


Figure S4: Ethyl acetate dispersion of a) unmodified and oxidized FCB, b) FCB-T particles

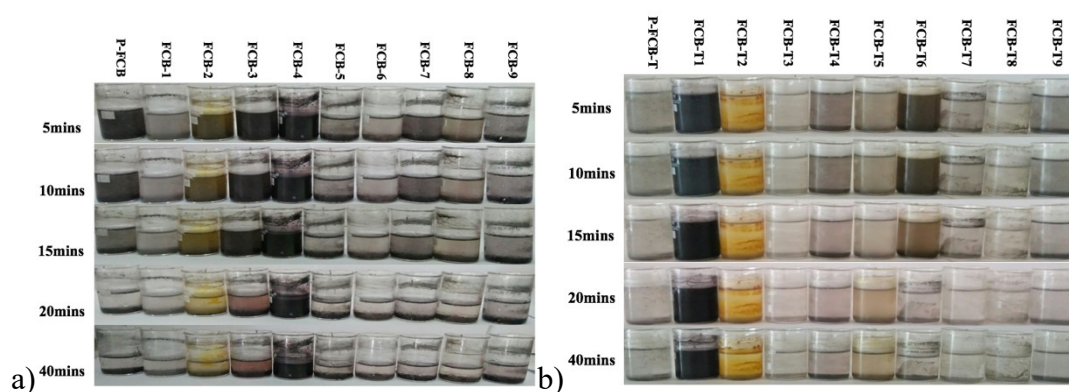


Figure S5: DCM dispersion of a) unmodified and oxidized FCB, b) FCB-T particles

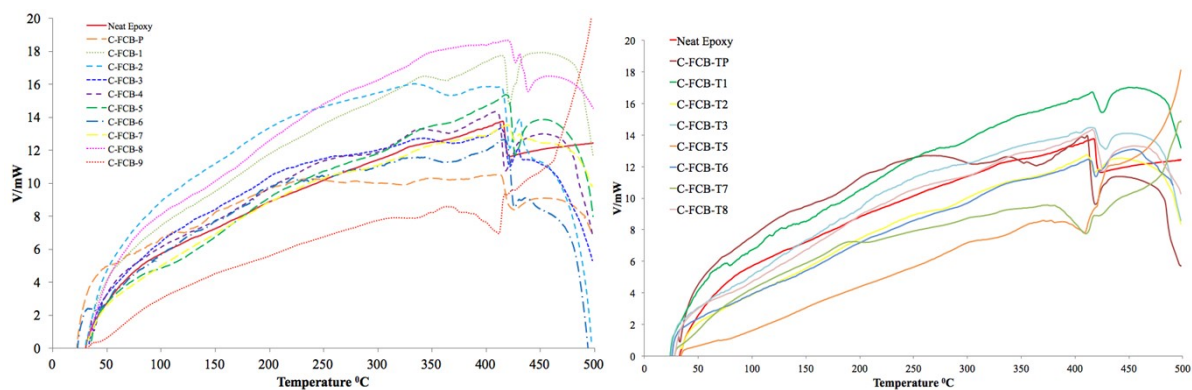


Figure S6: DSC profile of Neat epoxy, unmodified and modified FCB composites

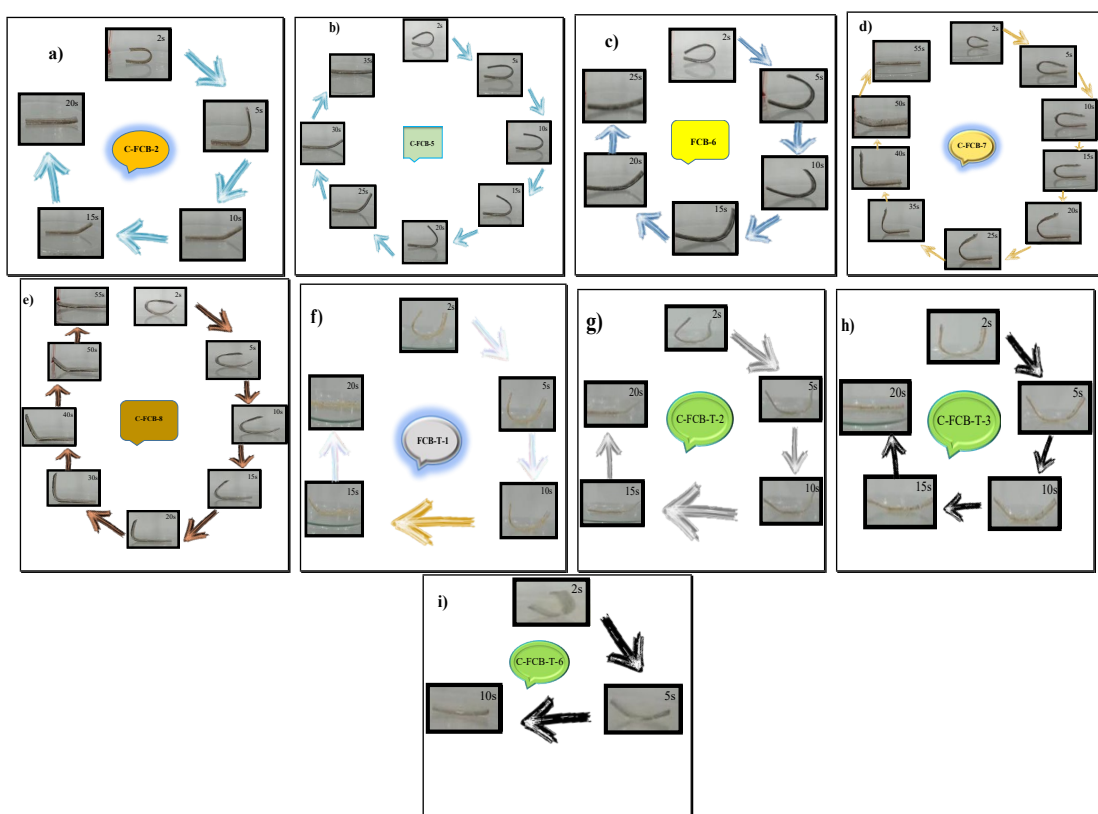


Figure S7: Shape recovery study of a) CFCB-2, b) CFCB-5 , c) CFCB-6, d) CFCB-7, e) CFCB-8, f) CFCB-T1, g) CFCB-T2, h) CFCB-T3 and i) CFCB-T6 composites

Table S1: Oxidation of FCB particles

Sample ID	Modifier	FCB:Modifier (Mass ratio)
FCB-1	Bismuth trichloride	5:1
FCB-2	Potassium Dichromate	5:1
FCB-3	Hydrogen peroxide	5:1
FCB-4	Phenyl Hydrazinium	5:1
FCB-5	Chloro Acetic Acid	5:1
FCB-6	Hydrochloric acid	5:1
FCB-7	Potassium Chlorate	5:1
FCB-8	Sodium Azide	5:1
FCB-9	HNO ₃	5:1

Table S2: Thiolation of FCB particles

Sample ID	Precursor	FCB:S:Thio Urea (Mass Ratio)
FCB-TP	FCB	1:1:0.2
FCB T1 – T9	FCB 1-9	1:1:0.2

Table S3: Weight loss profiles of unmodified and modified particles' composites

Sample ID	Temperature (°C) for Weight Loss				Mass % (500 °C)
	2%	5%	10%	50%	
Neat Epoxy	201.4	318.0	355.0	417.5	04.0
C-FCB-P	096.3	174.8	284.4	418.4	18.8
C-FCB-1	100.4	163.3	282.6	423.7	20.5
C-FCB-2	146.1	225.6	327.3	422.0	19.5
C-FCB-3	100.9	155.4	268.3	424.2	24.9
C-FCB-4	095.4	155.8	247.7	417.6	19.6
C-FCB-5	179.7	280.1	349.7	429.0	26.7
C-FCB-6	300.1	344.2	381.8	431.7	32.2
C-FCB-7	150.5	228.4	323.7	434.1	34.0
C-FCB-8	118.9	181.3	235.2	431.5	31.2
C-FCB-9	138.7	234.8	323.2	419.7	24.5
C-FCB-TP	118.8	177.5	277.1	418.0	18.7
C-FCB-T1	251.1	330.3	384.8	433.4	32.2
C-FCB-T2	096.6	199.7	316.5	421.7	26.2
C-FCB-T3	156.0	231.1	370.3	430.0	28.7
C-FCB-T5	097.8	154.7	231.9	414.7	22.0
C-FCB-T6	032.3	059.4	087.6	402.8	00.2
C-FCB-T7	038.2	077.5	135.0	408.5	06.2
C-FCB-T8	188.5	244.4	313.8	424.0	18.9

