

## Supplementary Data

### Section-1. Formulations of the composites

Table S1  
Formulations of prepared rubber composites

Formulation	CF/CB (0:0)	CF/CB (40:0)	CF/CB (30:10)	CF/CB (20:20)	CF/CB (10:30)	CF/CB (0:40)	PANI/CB (20:20)	PANI/CB (10:30)
RSS III/IV-Vietnam	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
BR. Cis 132	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
carbon fiber	<b>0.00</b>	<b>40.00</b>	<b>30.00</b>	<b>20.00</b>	<b>10.00</b>	<b>00.00</b>	<b>0.00</b>	<b>0.00</b>
N 375	<b>0.00</b>	<b>0.00</b>	<b>10.00</b>	<b>20.00</b>	<b>30.00</b>	<b>40.00</b>	<b>00.00</b>	<b>00.00</b>
CB/PANI composite	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>40.00</b>	<b>40.00</b>
Rubber Processing oil (Low PCA)	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
IPPD	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
TMQ	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zinc Oxide 99.5 %	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Stearic Acid	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
TBBS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TMTM	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
PVI	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Sulphur	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Total	121.5	161.5	161.5	161.5	161.5	161.5	161.5	161.5

## Section-2. Chemical properties of natural rubber composites

The FTIR image of vulcanized control (CF/CB (0:0)), PANI/CB (20:20) and CF/CB (20:20) are depicted in Fig. S1. The characteristic peaks of the composites are not shifted significantly due to addition of fillers such as CB, CF and PANI and that can be anticipated the interactions of filler and NR polymer are taken place by means of physical bonding except the chemical interactions.

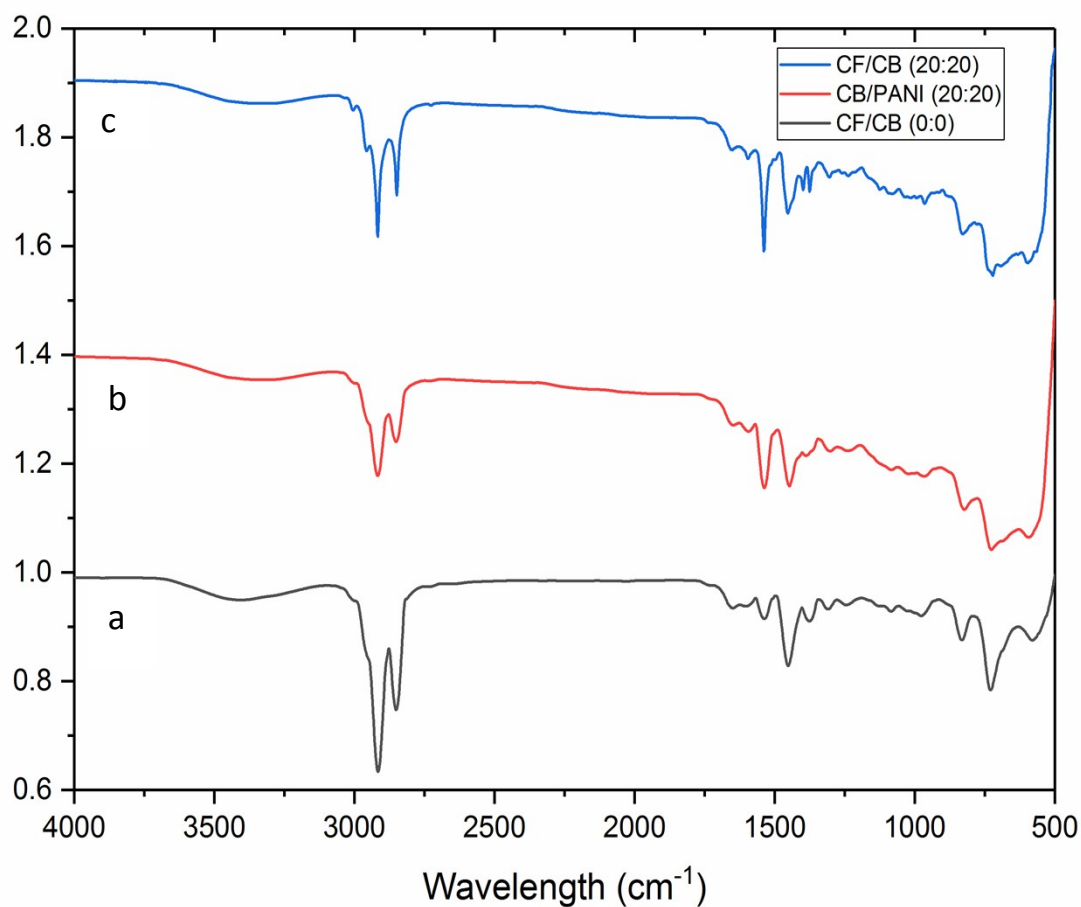


Fig. S1 FTIR images of (a) CF/CB (0:0) (b) PANI/CB (20:20) (c) CF/CB (20:20) prepared final rubber composites.