

Table S1: Designed ratio of reinforcements alongwith the selected sintering temperature and sintering time in sintering furnace

sample	Nature of composite	Sampling	Silicon Carbide SiC (37-45µm) (Percentage Wt %)	Zirconium silicate ZrSiO ₄ (< 50 nm) (Percentage Wt %)	SiC+ZrSiO ₄ (Percentage Wt %)	Sintering Temperature (°C)	Sintering Time (Min)
Al-SiC	Binary	S1	5	-	-	500	60
		S2	20	-	-	700	45
		S3	30	-	-	900	30
		S4	40	-	-	1100	15
Al- ZrSiO ₄	Binary	S5	-	5	-	500	60
		S6	-	20	-	700	45
		S7	-	30	-	900	30
		S8	-	40	-	1100	15
Al- SiC- ZrSiO ₄	Hybrid	S9	5	40	5+40	500	60
		S10	20	30	20+30	700	45
		S11	30	20	30+20	900	30
		S12	40	5	40+5	1100	15

MORPHOLOGICAL STUDY COMPOSITES MACHINED

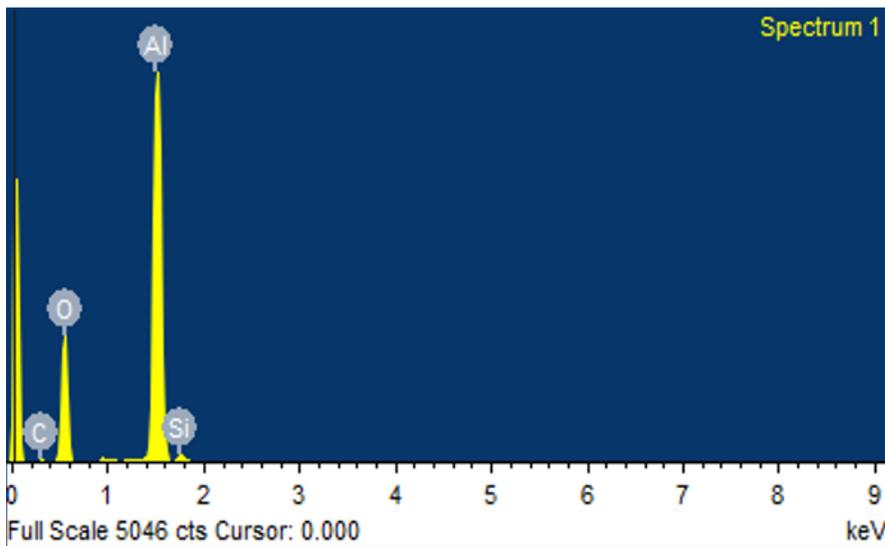


Figure S1 EDS spectrum of AMMC containing 20% SiC as reinforcement.

Table S2 Elements present in sample S1 containing 20% SiC as reinforcement.

Elements	Weight%	Atomic%
Al	44.98	32.44
Si	1.71	1.18
C	3.77	6.11
O	49.54	60.27

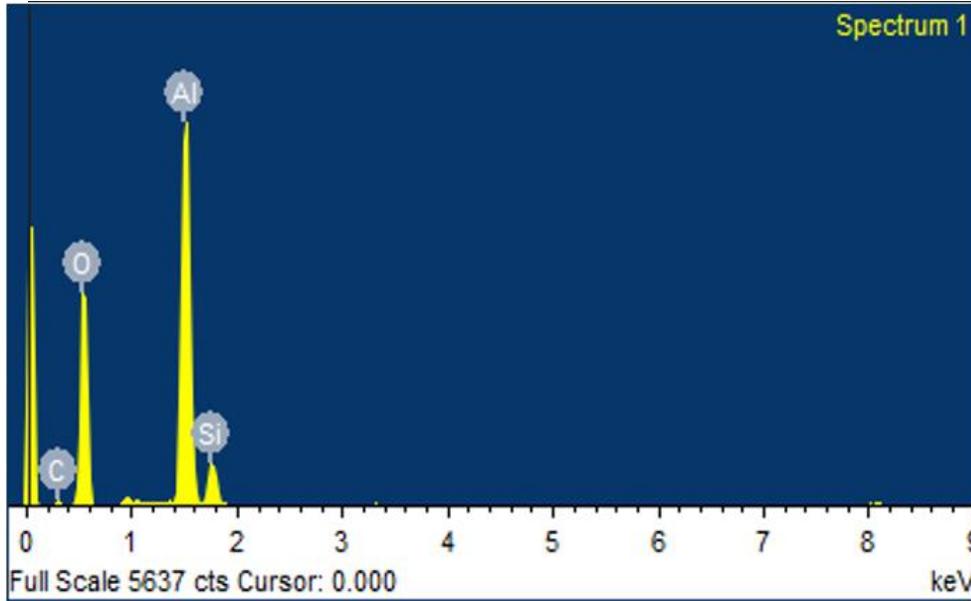


Figure S2 EDS spectrum of sample S3 containing 30% SiC as reinforcement.

Table S3 List of elements in AMMC containing 30% SiC as reinforcement.

Elements	Weight%	Atomic%
Al	32.5	22.4
Si	5.4	3.6
C	5.6	8.6
O	56.5	65.4

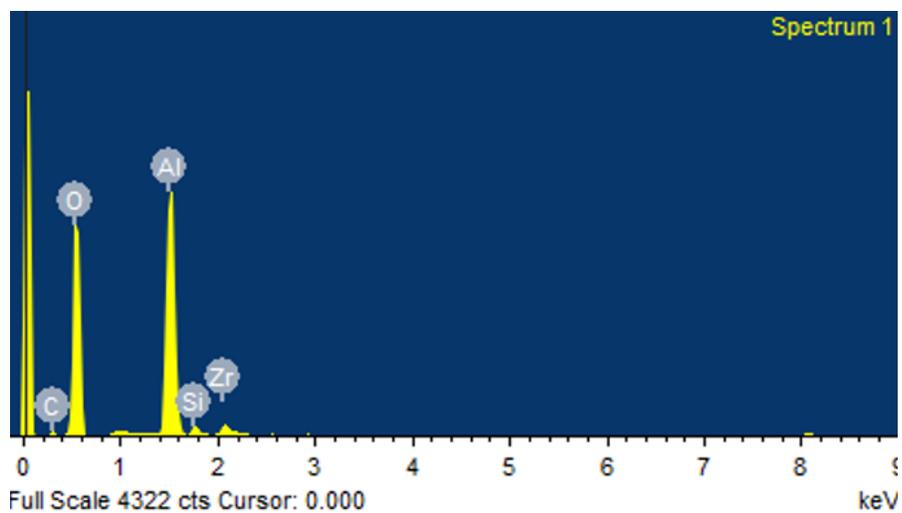


Figure S3 EDS spectrum of sample S4 containing 40% SiC as reinforcement.

Table S4 List of elements in AMMC containing 40% SiC as reinforcement.

Elements	Weight%	Atomic%
Al	26.4	17.9
Si	4.8	1.5
C	5.0	7.6
O	63.8	73.0

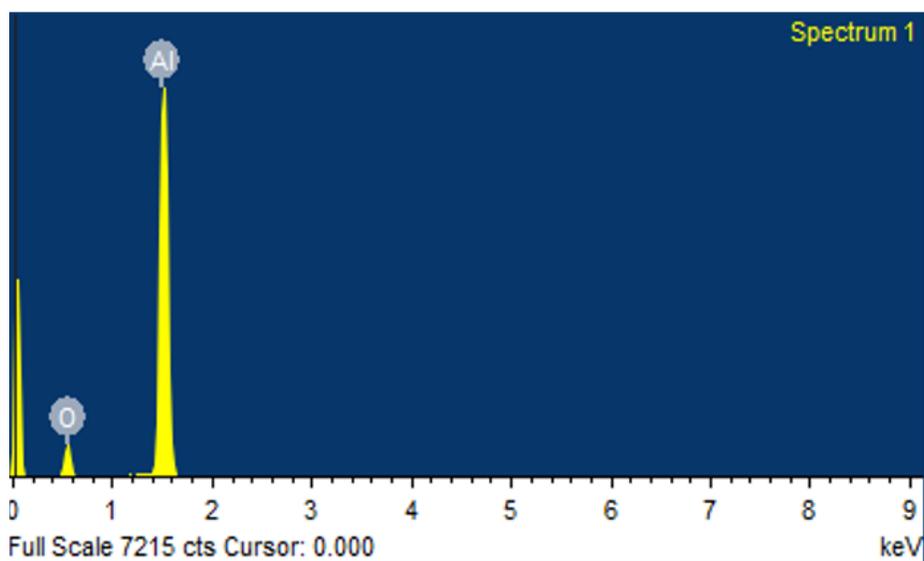


Figure S4. No text of specified style in document. EDS spectrum of sample S4 containing 20% ZrSiO₄ as reinforcement.

Table S5 List of elements in AMMC containing 20% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	23.38	20.88
Si	12.02	10.35
C	7.20	14.47
O	31.5	47.5
Zr	25.9	6.8

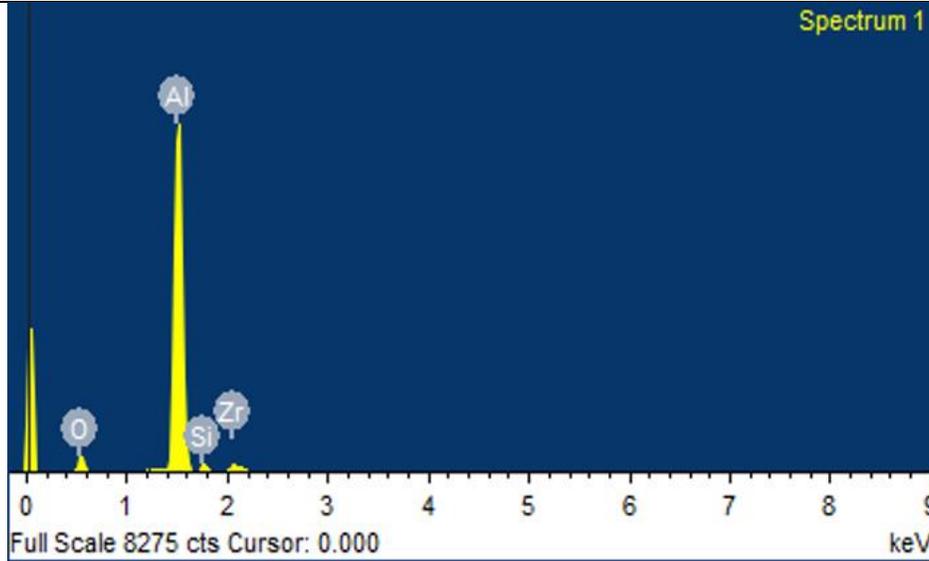


Figure S5 EDS spectrum of sample S4 containing 30% ZrSiO₄ as reinforcement.

Table S6 List of elements in AMMC containing 30% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	63.17	54.12
Si	2.77	2.28
C	7.46	14.40
O	18.8	27.2
Zr	7.8	2.0

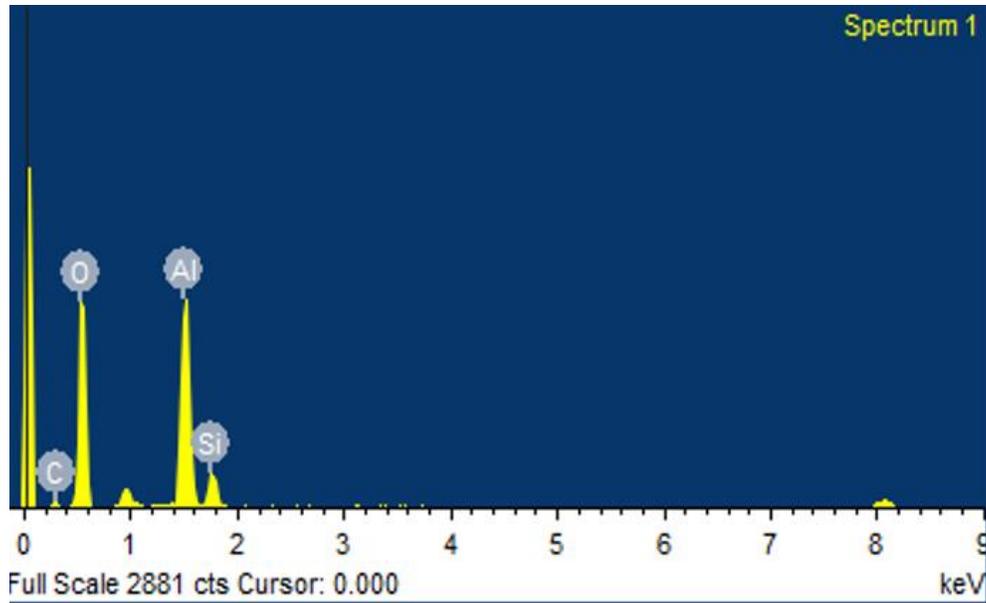


Figure S6 EDS spectrum of sample S4 containing 40% ZrSiO₄ as reinforcement.

Table S7 List of elements in AMMC containing 40% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	26.4	17.9
Si	1.2	0.6
C	5.0	7.6
O	63.8	73.0
Zr	3.6	0.9

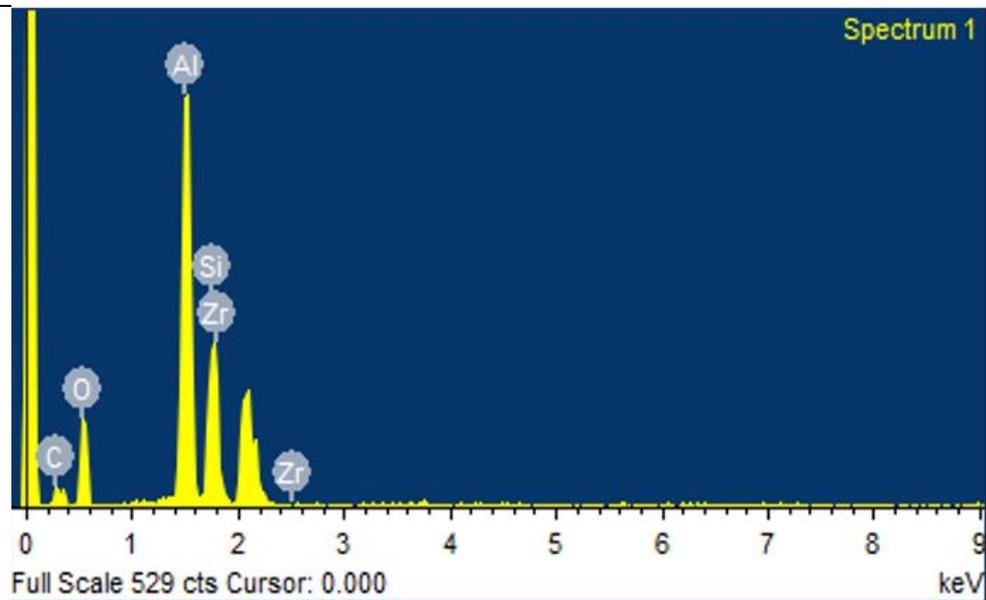


Figure S7 EDS spectrum of sample H1 containing 20% SiC and 30% ZrSiO₄ as reinforcement.

Table S8 List of elements in AMMC containing 20% SiC and 30% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	26.4	17.9
Si	1.2	0.6
C	5.0	7.6
O	63.8	73.0
Zr	3.6	0.9

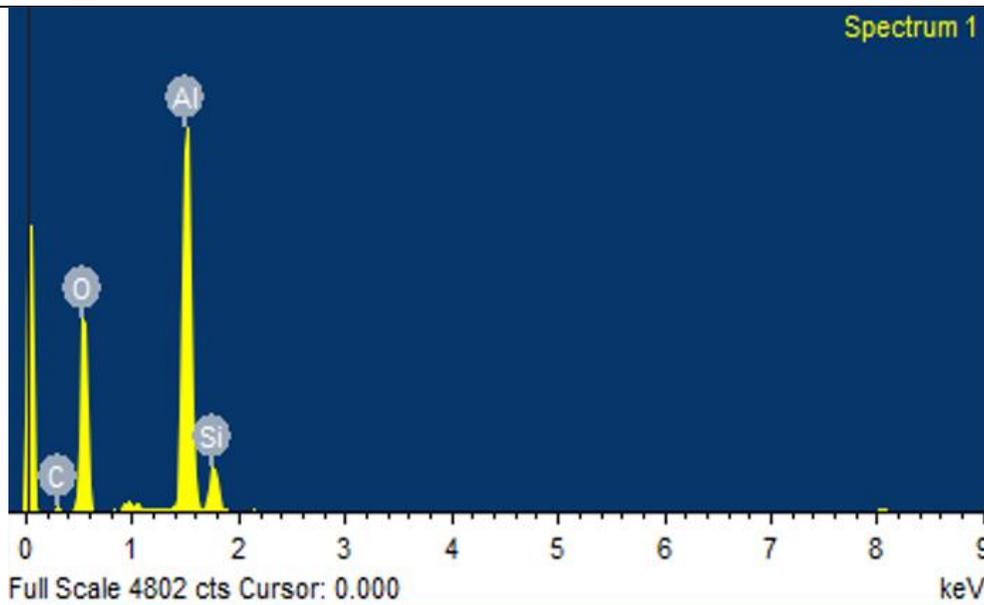


Figure S8 EDS spectrum of sample containing 30% SiC and 20% ZrSiO₄ as reinforcement.

Table S9 List of elements in AMMC containing 30% SiC and 20% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	44.55	37.34
Si	13.59	10.95
C	10.86	20.31
O	20.3	28.7
Zr	10.7	2.7

Table 4.20 justify the wt% of Si, C, Zr and O according to the selected wt% of supplements.

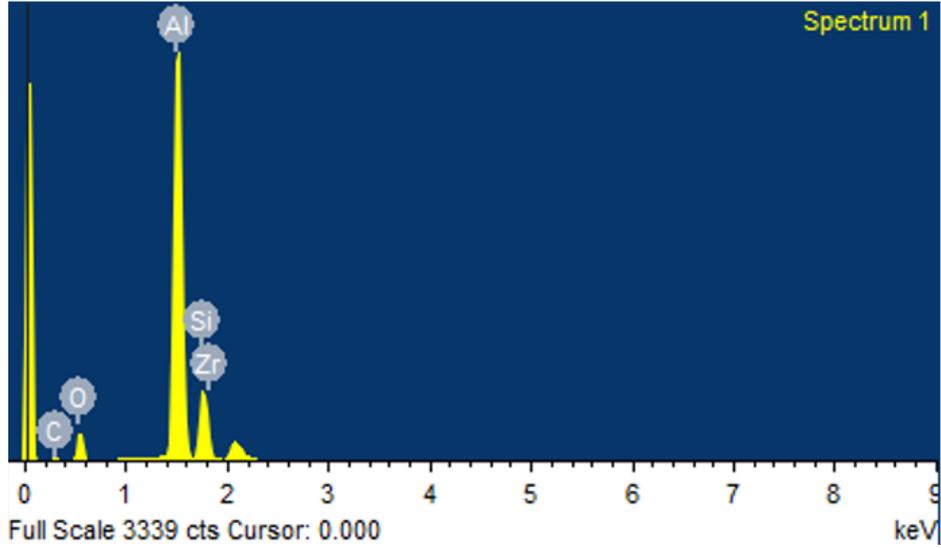


Figure S9 EDS spectrum of sample containing 40% SiC and 5% ZrSiO₄ as reinforcement.

Table S10 List of elements in AMMC containing 40% SiC and 5% ZrSiO₄ as reinforcement.

Elements	Weight%	Atomic%
Al	54.55	39.74
Si	12.7	11.2
Zr	3.3	2.76
C	10.83	22.0
O	18.62	24.3