Fire-Safety Solutions with Geopolymer Composites

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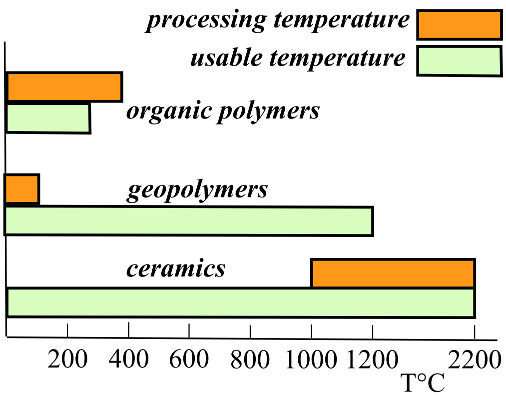
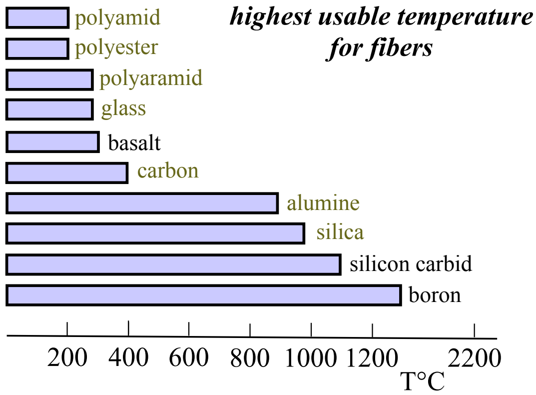
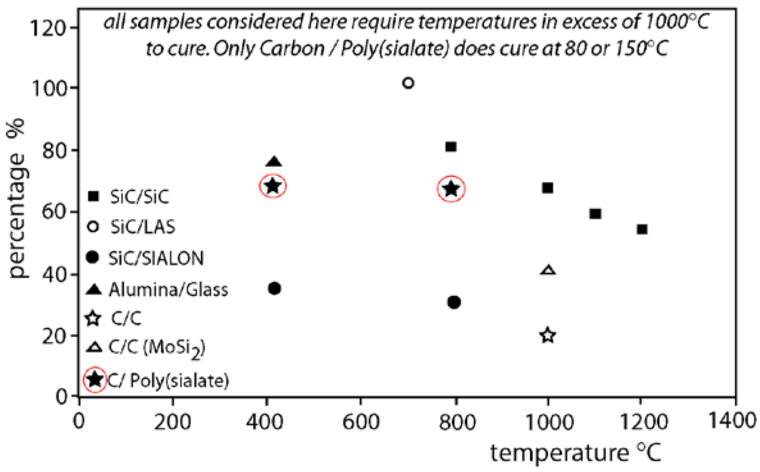


Processing and usable temperatures for organic-, geopolymer-, ceramic-matrix composites



Glass and basalt fibers are fire resistant but not heat resistant. Carbon fiber oxidizes above 450°C.

K-nano-Poly(sialate) composites, although made with carbon fibers, which are assumed to lose their strength at high temperatures, retained 63 percent of its original strength at 800°C. This is achieved because this particular K-nano-Poly(sialate) matrix protects the carbon fibers from oxidation during a limited amount of time (several hours max.). This fire-heat protection cannot be warranted for longer operational times like those required for structural applications, without a partial or total replacement of the carbon fiber with silicon carbide SiC.



Property	Max. temp. (°C)	n	Modulus (GPa)	Strength (MPa)
Inplane Shear	22	3	4.0 ± 0.1	30.5 ± 1.2
Interlaminar Shear	22	5		14.1 ± 0.6
	200	5		12.5 ± 0.3
	400	5		6.8 ± 0.4
	600	5		4.6 ± 0.1
	800	5		4.6 ± 0.2
	1000	5		5.6 ± 0.5
Warp Tensile	22	5	79 ± 2	343 ± 31
Flexure	22	5	45.3 ± 0.9	245 ± 8
	200	5	36.5 ± 4.0	234 ± 10
	400	5	27.5 ± 2.5	163 ± 6
	600	5	18.3 ± 1.4	154 ± 24
	800	5	12.3 ± 0.5	154 ± 9

Mechanical Properties of K-nano-Poly(sialate)-carbon fiber composites

Details in the book *Geopolymer Chemistry & Applications*