Additive Composite

Technical Note 2018/02/c

Neutron Shielding with ABS/boron carbide composites

Approximate attenuation factors – thermal neutrons (velocity 2200 m s^{-1}, wavelength 1.8 Å)

Wt. fraction	Vol. fraction	Thickness / mm	Att. Length (for 1/e) / mm	Attenuation	Transmission
0.4	0.225	5	0.526	1.34E+04	7.49E-05
0.2	0.098	5	1.206	6.32E+01	1.58E-02
0.15	0.072	5	1.659	2.04E+01	4.91E-02
0.15	0.072	10	1.659	4.15E+02	2.41E-03
0.15	0.072	15	1.659	8.45E+03	1.18E-04

Notes

- If space for shielding is limited, use of enriched ^{10}B boron carbide is possible and this increases the attenuation coefficient by approximately a factor of 5.
- For other thermal energies, the attenuation scales as 1/velocity.
- For some applications it may be useful to incorporate heavy metals as an integral component to protect against gamma radiation that is either external or created by neutron absorption. Tungsten composites can be incorporated in shielding.
- For high energy radiation, moderation of neutrons in the plastic can be a significant advantage but specific neutronic calculations may be needed.