



Addbor N25

A co-polyamide boron carbide composite filament for 3D-printable
neutron shielding applications



Additive Composite



add:north
3D-FILAMENT

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Using Addbor N25 you will be able to create neutron-absorbing components in complex shapes, suitable for your applications. These components can substitute the use of toxic heavy metals such as cadmium where legislations prohibit their use. Addbor N25 can safely be used for components that experience temperatures up to 100C.

The material is compounded with 25 % wt boron carbide that has a natural isotopic composition. The base polymer for the Addbor N25 is a co-polyamide with high printability, low shrinkage and extreme toughness. The polymer itself is excellent for high-strength, functional 3D-printed parts. It has superior strength and physical attributes when compared to consumer grade materials, which makes it the preferred choice for many industrial applications

The very low shrinkage rates of the co-polyamide allows for printing with very tight tolerances and accuracy. The excellent layer bonding, medium flexibility and good chemical and heat resistance makes it a very useful material for demanding applications.

- General print settings:
- Nozzle temperature: 250-270C
 - Bed temperature: 60-100C
 - Recommended bed adhesive: Geckotech + Magigoo

For more detailed settings visit <https://addnorth.com>

As boron carbide is very hard and abrasive we recommend printing only with hard nozzles such as the Olsson Ruby (<https://olssonruby.com/>). Other nozzles may wear quickly, and print quality is likely to degrade. We recommend a minimum nozzle diameter of 0.4 mm.

Neutron Shielding with nylon/boron carbide composite

The following table provides approximate attenuation factors for pieces of material made with natural boron carbide/nylon composite for thermal neutrons (velocity 2200 m s⁻¹ , wavelength 1.8 Å). If pieces are not made with a 100% fill of composite, the effective thickness used for a shielding calculation must make allowance for the reduced density.

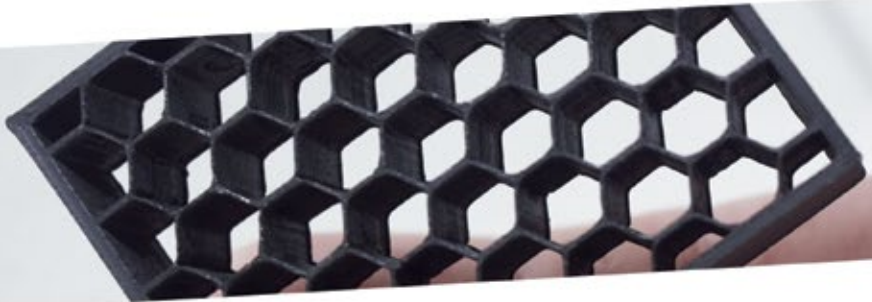
Wt. fraction	Vol. fraction	Thickness (mm)	Att. length (for 1/e)/mm	Attenuation	Transmission
0.25	0.13	0.5	0.9	1.7	0.570
0.25	0.13	1.0	0.9	3.0	0.332
0.25	0.13	2.0	0.9	9.7	0.110
0.25	0.13	5.0	0.9	260	3.8 x10 ⁻³
0.25	0.13	10.0	0.9	6.8 x10 ⁴	1.5 x10 ⁻⁵
0.25	0.13	15.0	0.9	1.7 x10 ⁷	5.6 x10 ⁻⁸

- For other thermal energies, the attenuation scales is 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.
- For high energy radiation, moderation of neutrons in the plastic can be a significant advantage but specific neutronic calculations may be needed.
- The expected density for products with 100% fill would be about 1.33 g cm⁻³

Additive Composites and add:north in unique collaboration

Additive Composite Uppsala AB was established in 2018 to commercialize developments of new composites and additive manufacturing technology. It has already delivered components to, for example, the European Spallation Source in Lund, Sweden.

Add North is a Swedish 3D materials developer specializing in 3D printable materials. From its start in 2016, the focus has been on sustainable plastic solutions as consumables and the development of new materials, with a current focus on technical materials.



Material re-export conditions

The material supplied is a composite of boron carbide and polymer. The material and/or components may be considered useful for several high technology applications. Some materials in this product have been imported. The material is therefore considered as subject to both any current European export control regulations and to USA re-export conditions and regulations. The material is sold on the basis that the purchaser acknowledges these conditions and will not re-export the material or products in contravention of these current regulations.



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