WELDSTONE
COMPONENTS GROUP

3D PRINTED TUNGSTEN COLLIMATORS

Who We Are

WELDSTONE is a multi-national company supplying more than 3,000 industrial products from a wide range of materials. Our product offerings in tungsten include TIG (GTAW) and plasma spray electrodes, pressed and sintered tungsten shapes, aerospace grade tungsten heavy alloys (WHAs), and 3D printed pure tungsten shapes. Quality and customer service are at the core of our operations. Please contact us with your specific radiation collimation and shielding requirements.

Additive Manufacturing (AM)

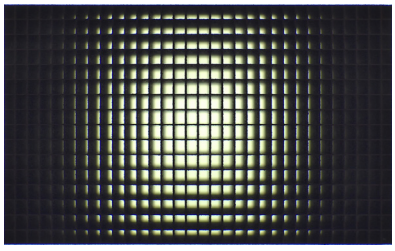
Additive manufacturing ("3D printing") has grown from a laboratory curiosity in the 1980s to a widely accepted disruptive technology for making complex shaped parts in a variety of materials ranging up to meter scale dimensions in some cases. 3D printing refers to a growing set of build technologies. The method of choice depends on the material(s) to be used and the size, shape, and quantity of parts to be built. Direct fusion approaches can utilize laser, e-beam, or electric arc.

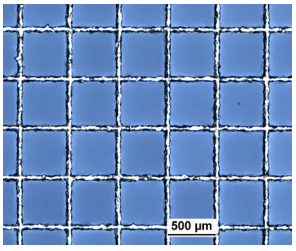
AM is very material conservative when compared to conventional (subtractive) machining. Every year brings about new developments in this field. Because of the way shapes are progressively formed, AM is capable of creating shapes that are impractical or in some cases impossible by conventional machining.

3D Printing Capabilities

Our process permits the following parameters:

- Max. build size (mm): 350 W x 350 L x 100 T
- Wall thickness (µm): >50
- Precision (µm): better than 10-25, shape dependent
- Production volume: >10,000 parts/yr.
- Hole shape: specify (square profile shown below)
- Nom. tungsten build density (g/cc): 17.4 (90% TD)
- Est. linear attenuation coeff. @ 511 keV*: 0.298 cm-1





The Tungsten Advantage

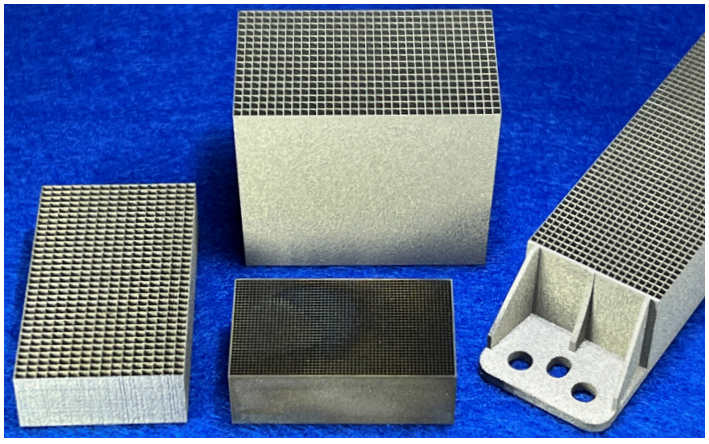
Due to the very high density of tungsten and its moderately high Z number, it is a superior material for the shielding and collimation of high energy photonic radiation. This is evident in the following comparison.

Element	Density (g/cc)	Z Number	Linear Atten. Coeff. * μ_L (cm^{-1}) @ 511 keV
W	19.3	74	0.268
Pb	11.3	82	0.389
Cu	8.96	29	0.741

**Calculated using NIST XCOM.*

As can be seen in the above table, tungsten offers a 31% attenuation advantage over pure lead. This benefit can be easily utilized for both bulk shielding and simple single aperture collimators made by conventional powder metallurgy, but the inability to cast tungsten (due to its high melting point of 3420C) has prevented its use for multi-pinhole collimators – until the advent of 3D metal printing. Now, virtually any 3D shape that can be drawn can be printed in tungsten. This includes x-ray collimators having parallel, slant, radial, and conical hole arrays.

The tungsten advantage means the potential for sharper radiation cutoff than conventional collimators, leading to higher contrast gamma camera images or better angular resolution when using parallel hole collimators in radiation survey devices. The superior strength of tungsten versus lead provides greater resistance to handing damage. Tungsten collimators are dimensionally stable over time, even in elevated temperature environments. They can be securely mounted without concern for creep-induced loosening. Tungsten provides excellent ambient corrosion resistance. And unlike lead, tungsten is a low toxicity metal – ideal for use in clinical environments. Explore the tungsten advantage for your collimator requirements.



Weldstone Americas, LLC - 6901 Bryan Dairy Road, Suite 110, Largo, FL 33777
Phone: 727-546-9600 - Website: www.anviloy.com/medical-and-shielding

ABICOR® GROUP