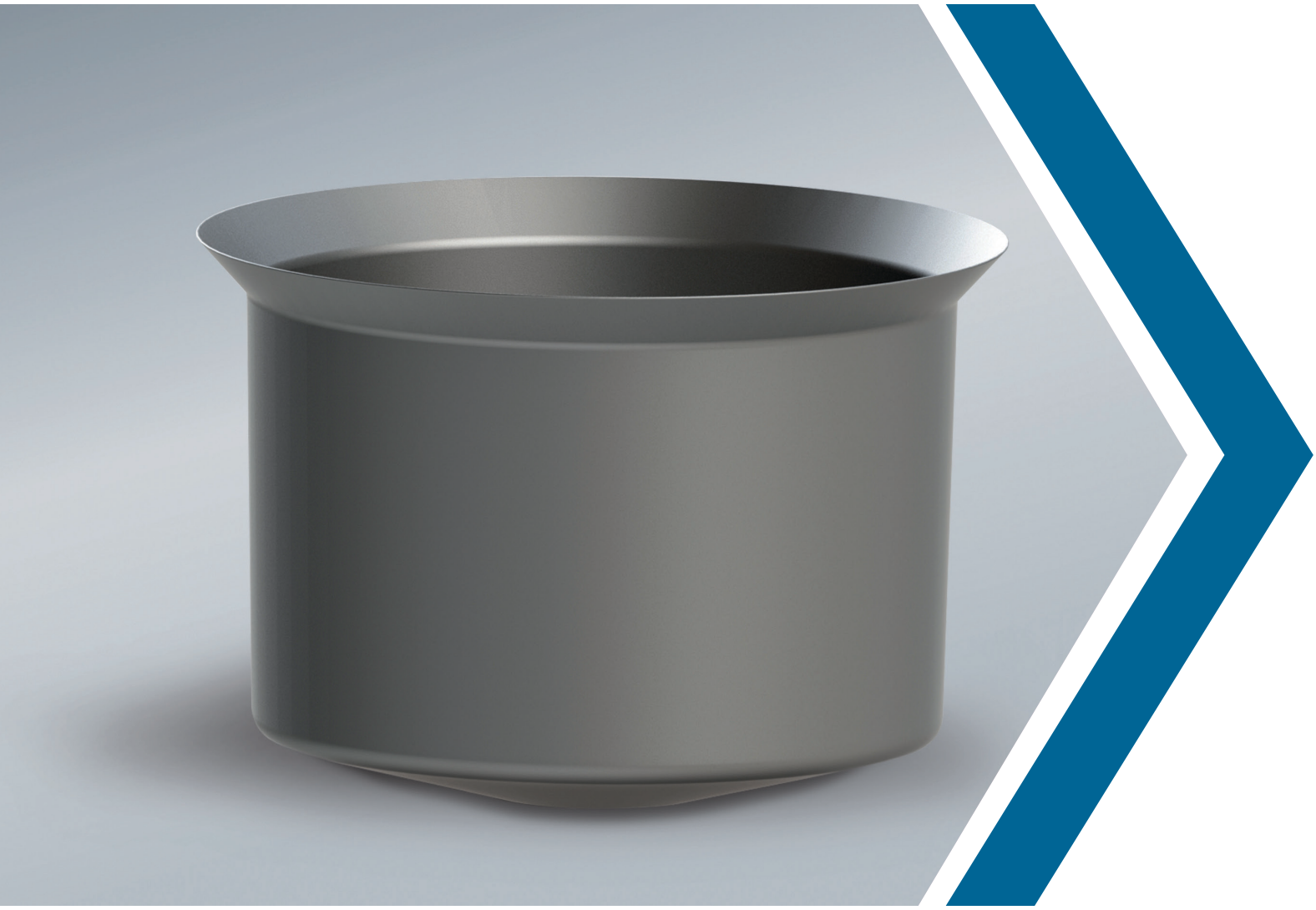
MOLYBDENUM SPUN CRUCIBLES FOR LED SAPPHIRE CRYSTAL GROWING



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CHOICE MATERIALS FOR SPUN CRUCIBLES

The sapphire crystal growing industry has seen a significant increase in the fabrication of crucibles for growing sapphire crystals used in the manufacture of LEDs. These crucibles have distinctive designs for melting alumina in a precise and highly controlled crystal growth environment.

Spun crucibles produced from molybdenum possess excellent thermal properties required to withstand the critical environment for growing sapphire crystals. Molybdenum is characterized by its high melting temperature, creep resistance, low thermal expansion coefficient (CTE), excellent thermal conductivity, which combined with low CTE, makes the entire crystal growing system very stable. In addition, molybdenum and other refractory metals do not contaminate the alumina melt resulting in a higher quality sapphire.

Molybdenum and Molybdenum/Tungsten Crucibles – Powder Metallurgy

> Pure Molybdenum (99.95 % minimum)

> MoW Blend (percentages vary depending on customer requirements)

DIMENSIONS	MINIMUM MM	MAXIMUM MM	
Input Thickness	2	8	Input thickness requirement is driven by overall crucible height and the amount of stretching done. In general, consider 2 mm for shorter narrower crucibles and 8 mm for longer wide crucibles. For non-consumable parts, thicker material can also add to the expected lifetime.
Outer Diameter	100	600	< 100 mm request a quote
Length of Finished Part	No limit	1000	
Input Size	-	1500	

For requirements outside the above ranges, please request a quote from Elmet Technologies.

With the addition of molybdenum spin forming, Elmet Technologies has become a vertically integrated company with the capability to refine molybdenum powder, press and sinter ingots, roll input material for spinning, spinning to form, trim, and clean molybdenum and molybdenum alloy crucibles. Elmet Technologies can manufacture a wide-range of diameter, height and thickness crucible sizes to suit our customers' needs.




SPIN FORMING CRUCIBLES

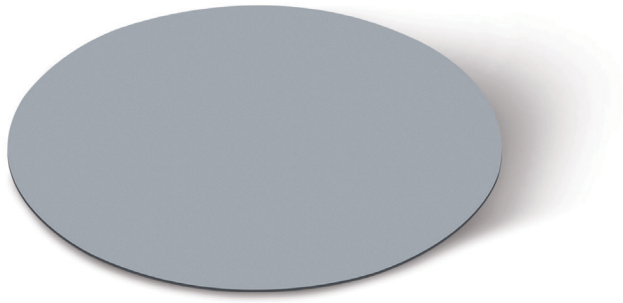
The core component of Elmet Technologies' crucible is our pure molybdenum plate, which is input into the spinning process. Beyond the input material, the spinning procedure is performed the same way it would be on steel, but the material is heated during the spinning process to improve formability. Elmet Technologies has developed a unique process to repeatedly make defect-free crucibles with little down time in the crucible production process.

Spinning can be used for other materials like molybdenum alloys and tungsten. These materials also need to be heated to become more ductile and improve formability.

Spin forming is ideal for large diameter, tall, thin-walled crucibles, because the material yield is high, wall thickness can be precision-controlled. The cycle time to spin a thin-walled crucible is very short and well-suited for high volume production. Although, there are other methods to make crucibles, spin forming remains the most economical.

Elmet Technologies produces crucibles for the Heat Exchanger Method (HEM) using spin forming. During crystal growth via HEM, the temperature required for melting the alumina crackle is held constant and when the thermal stress affecting the crucible is low, thin-wall spun molybdenum crucibles can be used. In other methods such as Kyropoulous,the thermal gradient is quite severe and requires thicker-walled crucibles made from molybdenum, molybdenum alloys or tungsten.

Sapphire crystal boule produced from crystal growing process.



Input material for spinning process.

Molybdenum spun crucible output.

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ELMET TECHNOLOGIES
1560 Lisbon Street • Lewiston, Maine 04240

P +1.207.333.6100

sales@elmettech.com
www.elmettechnologies.com