



# GRAFSTAR™ Solar Silicon

Amsted Graphite Solutions for the Solar Industry



Amsted Graphite Materials portfolio of advanced graphite solutions for polysilicon and ingot processing meet the challenges of the solar and semiconductor industries. Our products support the global growth of green energy by enabling higher efficiencies, lower operating costs, and further process innovation.

- Customizable solutions designed for high temperature and high purity processes in chemically aggressive atmospheres
- Advanced insulation products provide a stable, uniform thermal environment



## Amsted Graphite Materials for Your Solar Solution

Our broad graphite portfolio is trusted by global leaders in polysilicon production and crystal growing.

- Optimized for performance
- < 10 ppm impurity
- Machinable to precise tolerances for intricate equipment
- Enables larger batch size crucibles
- In-house machining, purification and coating for production consistency
- Largest monolithic graphite billet in the world



## High Temperature Insulation Takes the Heat

Customized engineered solutions for the most demanding chemical and thermal environments.

- High purity reduces contamination and defects
- Fully machinable materials can be precisely shaped to your application
- Highly insulative, low thermal conductivity reduces energy consumption and costs
- Low mass for faster furnace heating and cooling, plus reduced cycle times
- Composite materials and component systems provide performance excellence for custom solutions





## One Source for Your Solar Solutions From Polysilicon to Crystal Growing

Our solutions provide advantages across the entire range of silicon manufacturing processes.

- Upgraded metallurgical grade silicon
- Chemical vapor deposition (CVD) polysilicon
- Developmental technologies and fluidized bed reactors
- Monocrystalline silicon ingots
- Multicrystalline silicon ingots
- Thin film silicon processing

# Integrated Solutions for the Polysilicon & Solar Industries

Polysilicon Production	Crystal Growing
	
<p><b>Upgraded Metallurgical Grade Silicon</b> Applications: Crucibles, Molds, Fixtures, Electrodes, Insulation</p>	<p><b>Monocrystalline Silicon Ingot: CZ Process</b> Applications: Heaters, Crucibles, Heat Shields, Hot Zone Parts</p>
<p><b>Chemical Vapor Deposition (CVD) Polysilicon</b> Applications: Electrodes ('sockets'; 'seed chucks'), thermal and chemical management solutions</p>	<p><b>Multicrystalline Silicon Ingot: DSS Process</b> Applications: Heaters, Plates, Insulation, Fixtures</p>
<p><b>Developmental Technologies and Fluidized Bed Reactors</b> Emerging technologies for polysilicon production benefit from AGM's industry experience, material science expertise and broad product portfolio</p>	<p><b>Thin Film Processing</b> Applications: Boats, Insulation, Fixtures</p>

## Amsted Graphite Materials' Products Provide the Highest Quality Graphite Solution for the Polysilicon, Solar and Semiconductor Markets

CTE	Purity	Strength	Thermal Conductivity	Specific Resistance
Broad product portfolio includes grades with coefficient of thermal expansion optimized for the polysilicon and solar industries	Halogen purification reduces impurities to < 10 ppm	Tensile, flexural, and compressive strength improve as temperature increases	Products with high thermal conductivity or excellent insulating value, depending on form and application	Unique ability to act as an electrical conductor or resistor depending on the application



### Global Technical Support

Our global team of Applications Engineers are knowledgeable about graphite and applications spanning multiple industries. These include metallurgical casting, electronics, chemical, nuclear, defense/aerospace, solar, LED, semiconductor, and other high temperature processes.

Regardless of your product design phase (concept, prototyping, or mass production), we offer technical answers to some of your most challenging problems with a fast response time.

