Available Custom Options

Material

- **Ceramic**
  - Silicon Carbide
  - Alumina
  - Boron Carbide
  - Yttrium Oxide
  - Zirconium Oxide
  - Mullite
  - Spinel
- **Metal**
  - Stainless Steel
  - Low Alloy Steel (4140)
  - Maraging Steel
  - High Entropy Alloy
  - Titanium
- **Glass**
  - Aluminosilicate
  - Borosilicate
  - Soda-lime

Size

- Minimum Size: 500 µ
- Maximum Size: ~ 10 cm

Shape

- Spheres
- Rectangles
- Prisms
- Cylinders
- Oblate Spheres
- Many More

Texture

- Smooth
- Whiskered

Density

- Controlled by Wall Thickness
- Controlled by Material

Controlled Pressure

- 15 - 500 Torr

Optional Fill

- **Gas Mixtures**
  - Helium
  - Neon
  - Argon
  - Xenon Krypton
  - Nitrogen
  - Hydrogen

Other Encapsulated Materials

Material Layering

Market Opportunities

Oil Recovery

- Well Aids
- Surfactant Delivery
- Thermal Insulation
- Spill Containment

Personal Safety

- Microwave Detection
- Nuclear Detection

Buoyancy & Insulation

- Advanced Syntactic
- Foam Materials
- Drill Riser Supports
- Low Density Cement

Oil Refining

- Catalytic Beds

Filtration & Purification

- UV Water Purification
- Filtration

Other Markets

- Aerospace, Military, Nuclear,
- Lighting, Displays, and Signage

DarkStar™
SiC 1mm Spheres

DarkStar™
SiC 3mm Spheres

DarkStar™
SiC 6.5mm Spheres

DEEP SPRINGS TECHNOLOGY
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www.teamdst.com

DEEP SPRINGS TECHNOLOGY

DarkStar™

SiC Hollow Shells

Buoyancy
Armor
Structural
Thermal

Hollow Spheres

SILICON CARBIDE SHELL COMPOSITES

Deep Springs Technology (DST) produces high strength low density hollow shells for demanding engineering applications. When temperature, weight, and strength are critical factors to the success of your program, Deep Springs Technology can answer these needs with engineered shells tailored for your programs specific needs.

Deep Springs Technology's Silicon Carbide (SiC) DarkStar™ line of hollow shells offers your design engineers the freedom to explore further into the realm of possible by offering off the shelf solutions, as well as custom shells designed for a particular application.

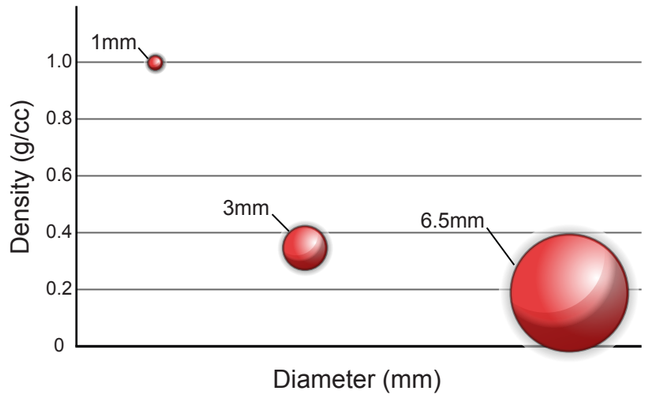
Deep Springs Technology's DarkStar™ SiC Shells placed in an aluminum matrix results in a composite density of 1.62 g/cc. This results in a 40% reduction of total weight versus ordinary aluminum which has a nominal density of 2.7 g/cc.

flexible solutions for your material needs

CUSTOM SHELL SOLUTIONS

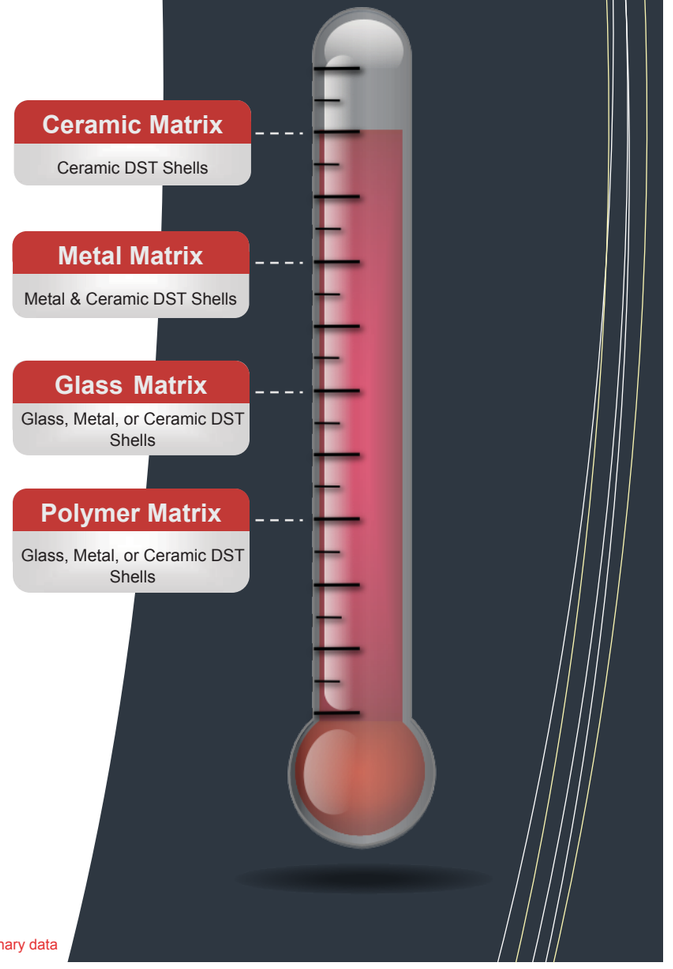
- VARIETY OF MATERIAL OPTIONS
- CONTROLLABLE DENSITY
- SHELL MATERIAL LAYERING
- CUSTOMIZABLE SIZE
- SELECTION OF FILL OPTIONS
- OPTIONAL MATRIX COMPOSITES
- ASSORTMENT OF SHELL SHAPES
- TEXTURE OPTIONS AVAILABLE
- ENCAPUSULATION OF LOOSE MATERIAL
- SELECTABLE FILL GAS PRESSURE

Sphere Density versus Sphere Diameter



DARKSTAR™ SHELLS CAN BE USED AS AN ELEMENT IN ALL COMPOSITE TYPES

Deep Springs Technology's Silicon Carbide shells can withstand extreme temperatures. This allows us to embed our spheres in wide variety of matrix materials, creating a diverse range of composite materials. Unlike many other microsphere technologies, our Silicon Carbide shells can survive the high temperature environments of metal and ceramic matrixes.



DarkStar™ Product Specifications

DarkStar 1MM

Bulk Density: 0.88 g/cc
True Sphere Density: 1.41 g/cc
Max Ambient Temperature: 1650 °C

DarkStar 3MM.1

Bulk Density: 0.22 g/cc
True Sphere Density: 0.35 g/cc
Max Ambient Temperature 1650 °C
Hydrostatic Crush Strength: 8 Ksi*

DarkStar 3MM.2

Bulk Density: 1.02 g/cc
True Sphere Density: 1.85 g/cc
Max Ambient Temperature 1650 °C

DarkStar 6.5MM.1

Bulk Density: 0.19 g/cc
True Sphere Density: 0.30 g/cc
Max Ambient Temperature 1650 °C
Hydrostatic Crush Strength: 6 Ksi*

DarkStar 6.5MM.2

Bulk Density: 0.24 g/cc
True Sphere Density: 0.39 g/cc
Max Ambient Temperature 1650 °C
Hydrostatic Crush Strength: 12 Ksi*

* preliminary data