

# DuPont™ Biasill®

## STAUROLITE SAND

DuPont produces Biasill®, a staurolite sand, from its own heavy mineral deposits in Starke, Florida. This naturally occurring, rounded staurolite sand (general formula  $\text{FeAl}_5\text{Si}_2\text{O}_{12}\text{OH}$ ) is washed and graded to ensure freedom from dust, dirt, and ultrafines. The staurolite sand is magnetically separated from other heavy minerals to produce a highly uniform grade.

### Uses of Biasill® Sand

Biasill® staurolite sand has uses in both the abrasive blasting and foundry industries.

#### Abrasive Blasting

Biasill® sand is used as a low free silica abrasive for air sand-blasting. Biasill® cleans faster, safer, and more efficiently than silica sand.

Biasill® is most useful where mill scale and light rust are to be removed and in applications where a shallow profile is desired. Because it is a finer grade sand, Biasill® also can be used on softer substrates such as aluminum, composites, fiberglass, and similar materials.

Biasill® is a slightly finer grade of staurolite sand than our coarser Starblast® blasting abrasives and is CARB-certified.

#### Foundry

Biasill® sand is used as a foundry mold sand where its low coefficient of thermal expansion and high thermal conductivity reduce casting defects and yield improved metal surfaces.

#### Nonferrous Applications

It is used most extensively in foundries because its AFS grain fineness number of 66–75 makes it suitable for most foundry mold applications involving the following metals:

- aluminum
- magnesium
- brass and bronze
- ferrous metals (limited to specialized applications described in the following paragraphs)

The low melting point of Biasill® (1370–1540°C [2500–2800°F]) limits its use to small thin sectioned castings.

#### Ferrous Applications

In applications where it can be used to produce small iron castings, Biasill® blended with silica sand offers the following benefits:

- lower binder demand (approximately 25% less), less gas evolution, and easier sand reclamation
- lower thermal expansion, very good control over expansion defects, ratters, veining, and good casting definition and dimensional accuracy
- more dense structure, which reduces strip times, improves cure times, and improves casting detail through less compaction around the pattern
- more dense metal structure, which varies with the amount of silica sand used in the sand blend
- promotes chill for metal solidification



*The miracles of science™*

## General Advantages as Foundry Mold Sand

| Staurolite Property   | Benefits   |
|---|--|
| Low thermal expansion versus silica sand (see <b>Figure 1</b> ) | Reduces thermal cracking and warpage.<br>Improves dimensional accuracy.  |
| High thermal conductivity                                       | Finer grained castings. Reduces shell and hot box cure cycles.<br>Improves shakeout because binder burnout is more complete. |
| Clean, round grains; free of fines                              | Reduces binder demand. Less gas evolution.<br>No clay; low Acid Demand Value (ADV).  |
| Hard, durable grains  | Less fracture in mulling and reclamation.<br>High recovery for recycle.  |
| Useful in sand blends, (20–50%) with silica                     | Low thermal expansion at minimum cost.   |

As a flour, Biasill® is adequate for many mold washes and offers a significant cost savings. It provides foundries with low thermal expansion and refractoriness at a much lower cost than zircon and other flours used in wash applications.

## Physical, Mineral, and Chemical Properties of DuPont™ Biasill® Foundry Sand

### Typical Screen Analysis

| U.S. Sieve No.* | Sieve Opening, $\mu\text{m}$ | Retained on Sieve, % |
|-----------------|------------------------------|----------------------|
| 40              | 420                          | <1                   |
| 50              | 300                          | 5                    |
| 70              | 212                          | 30                   |
| 100             | 150                          | 41                   |
| 140             | 106                          | 19                   |
| 200             | 75                           | 3                    |
| 270             | 53                           | 1                    |
| PAN             | <53                          | Trace                |

AFS Grain Fineness Range 66–75 (Grit #70/90)

\* U.S. Sieve Series according to ASTM E-11-70

### Physical Properties

|                                 | Range   |
|---------------------------------|---|
| Bulk Density (uncompacted)      | 2080 kg/m <sup>3</sup> (128 lb/ft <sup>3</sup> )                      |
| Specific Gravity                | 3.8–3.85  |
| Hardness (Mohs)                 | 6.5–7.0   |
| Melting Point                   | 1370–1540°C (2500–2800°F)   |
| Coefficient of Linear Expansion | 14.2 x 10 <sup>-6</sup> cm/cm·°C<br>(7.9 x 10 <sup>-6</sup> in/in·°F) |

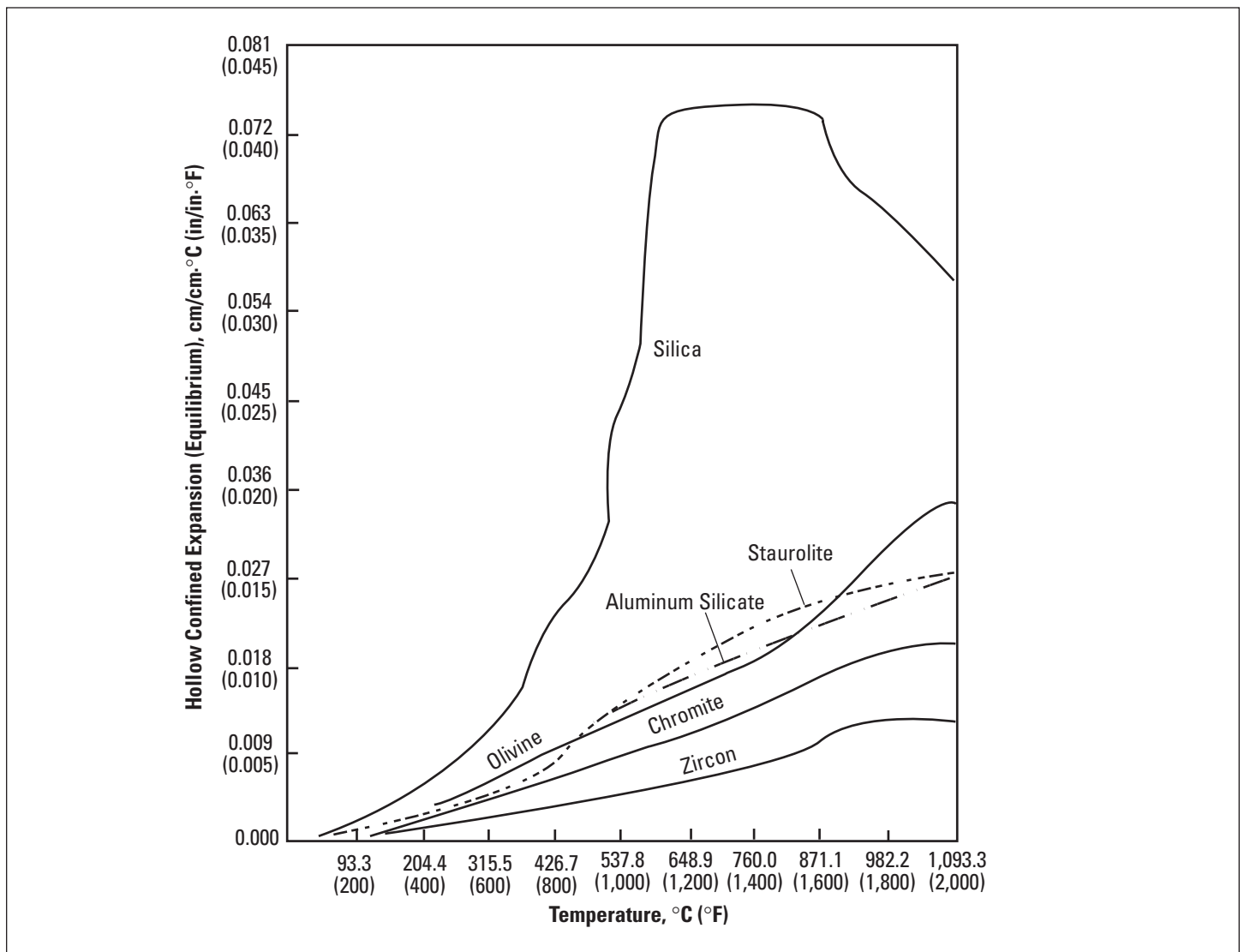
### Mineral Composition

|                      | Typical, % |
|----------------------|------------|
| Staurolite Minerals  | 86         |
| Titanium Minerals    | 6          |
| Kyanite              | 2          |
| Zircon               | 3          |
| Quartz (Free Silica) | 3          |

### Chemical Composition

|                                | Typical, % |
|--------------------------------|------------|
| TiO <sub>2</sub>               | 4          |
| Al <sub>2</sub> O <sub>3</sub> | 49         |

**Figure 1. Thermal Expansion Coefficients of Mineral Sands**



## Personal Safety

DuPont™ Biasill®, as shipped, does not pose any inhalation health hazard, because Biasill® contains essentially no particles in the respirable size range. However, if during handling or use, the Biasill® particles are broken down to a size that can be inhaled, the dust may be harmful to the respiratory system.

Biasill®, as a staurolite sand product, may contain up to 5% crystalline silica (quartz). Long-term overexposure to respirable crystalline silica may cause silicosis. The U.S. Department of Labor (OSHA)\* has ruled that an employee's exposure to particulates, not otherwise regulated, should not exceed 5 mg/m<sup>3</sup> (respirable dust), 15 mg/m<sup>3</sup> (total dust), 8-hr time-weighted average (TWA). When these limits might be exceeded, employees should wear dust masks or respirators approved by NIOSH for such dusts.

## Packaging

Biasill® sand is available in 22.7-kg (50-lb) multiwall paper bags, 4,000-lb bulk bags, and in bulk carloads and truckloads. Department of Transportation (DOT) Hazard Classification: \* NOT REGULATED.

\* Due to changing governmental regulations, such as those in the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency, and the Food and Drug Administration, references herein to governmental requirements may be superseded. Each user should consult and follow the current governmental regulations, such as: Hazards Classifications, Labeling, Food Use Clearances, Worker Exposure Limitations, and Waste Disposal Procedures for the products described in this literature.

**DuPont Titanium Technologies**

**[www.titanium.dupont.com](http://www.titanium.dupont.com)**

This information corresponds to technical data DuPont believes to be reliable. This information may be subject to revisions as additional experience and knowledge are gained. It is offered solely to provide possible suggestions for your own experimentation. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper personal protection equipment needed. Because conditions are outside of our control, DUPONT MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, AND ASSUMES NO LIABILITY WHATSOEVER AS TO THE PERFORMANCE OF THIS PRODUCT FOR A PARTICULAR USE. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent or trademark right.

Copyright © 2006 DuPont. All rights reserved. The DuPont Oval Logo, DuPont™, The miracles of science™, and Biasil® are registered trademarks or trademarks of E. I. du Pont de Nemours and Company or its affiliates.

H-69481-3 (5/06) Printed in the U.S.A.



*The miracles of science™*