



Semiconductor Materials Information

# Quartz

For Semiconductor Applications

## Crucibles, Base Materials and Consumable Equipment Parts

### a TECHCET Critical Materials Report

Prepared by

Lita Shon-Roy

TECHCET Group  
A Techcet CA LLC Company  
PO Box 3056  
Rancho Santa Fe, CA 92067  
[www.techcet.com](http://www.techcet.com)  
[info@techcet.com](mailto:info@techcet.com)  
[+1-480-382-8336](tel:+14803828336)

## RESEARCH METHODOLOGY

Techcet employs subject matter experts having first-hand experience within the industries which they analyze. Most of Techcet's analysts have over 25 years of direct and relevant experience in their field. Our analysts survey the commercial and technical staff of IC manufacturers and their suppliers, and conduct extensive research of literature and commerce statistics to ascertain the current and future market environment and global supply risks. Combining this data with Techcet's proprietary, quantitative wafer forecast results in a viable long-term market forecast for a variety of process materials.

Readers Note: This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies or individuals. Data was obtained from sources considered reliable. However, accuracy or completeness is not guaranteed.

## Table of Contents

|  |           |
|--|-----------|
| <b>1 Executive Summary .....</b>   | <b>7</b>  |
| <b>1.1 General Market Conditions .....</b>                                   | <b>7</b>  |
| <b>1.2 High-Purity Quartz Powder .....</b>                                   | <b>7</b>  |
| <b>1.3 Base Materials .....</b>  | <b>8</b>  |
| <b>1.4 Fabricated Quartz Components .....</b>                                | <b>9</b>  |
| <b>2 General Market Conditions .....</b>                                     | <b>10</b> |
| <b>2.1 Global Semiconductor Market.....</b>                                  | <b>10</b> |
| <b>2.2 Wafer Fab Equipment Market .....</b>                                  | <b>10</b> |
| <b>2.3 Silicon Wafer Starts .....</b>  | <b>11</b> |
| <b>3 Introduction to Quartz Products for Semiconductor Applications.....</b> | <b>12</b> |
| <b>4 High-purity quartz powder market landscape.....</b>                     | <b>14</b> |
| <b>4.1 Product Overview .....</b>  | <b>14</b> |
| <b>4.2 Market Status – Quartz Powder .....</b>                               | <b>14</b> |
| <b>5 Quartz crucibles market landscape.....</b>                              | <b>15</b> |
| <b>5.1 Product Overview .....</b>  | <b>15</b> |
| <b>5.2 Market Status - Crucibles.....</b>                                    | <b>17</b> |
| <b>5.3 Impact of 450-mm Silicon Wafer Issues .....</b>                       | <b>20</b> |
| <b>6 Quartz Base Materials Market Landscape .....</b>                        | <b>21</b> |
| <b>6.1 Product Overview .....</b>  | <b>21</b> |
| <b>6.2 Market Status – Base Materials .....</b>                              | <b>24</b> |
| <b>7 Fabricated Quarts Components Market Landscape .....</b>                 | <b>28</b> |
| <b>7.1 Quartz Components by Wafer Process Tool Types .....</b>               | <b>28</b> |
| <b>7.1.1 Thermal Processes .....</b>   | <b>28</b> |
| <b>7.1.2 Dry Etching Process .....</b>                                       | <b>31</b> |
| <b>7.1.3 Plasma CVD .....</b>  | <b>34</b> |
| <b>7.1.4 Epitaxial Process .....</b>   | <b>35</b> |
| <b>7.2 Market Status –Fabricated Components .....</b>                        | <b>37</b> |
| <b>7.3 Impact of 450-mm Silicon Wafer Issues on Fabricated Parts .....</b>   | <b>42</b> |
| <b>8 Supplier and Manufacturers .....</b>                                    | <b>43</b> |
| <b>8.1 Quartz Sand .....</b>   | <b>43</b> |
| <b>8.1.1 UNIMIN Corporation .....</b>  | <b>43</b> |
| <b>8.1.2 The QUARTZ Corp .....</b>   | <b>44</b> |
| <b>8.1.3 Russian Quartz LLC .....</b>  | <b>45</b> |
| <b>8.1.4 Polar Quartz.....</b>   | <b>45</b> |
| <b>8.1.5 Nordic Mining ASA.....</b>  | <b>45</b> |
| <b>8.2 Quartz Crucibles .....</b>  | <b>46</b> |
| <b>8.2.1 Shin-Etsu Quartz (A joint Venture with Heraeus) .....</b>           | <b>46</b> |
| <b>8.2.2 Japan Super Quartz (A Business Division of SUMCO).....</b>          | <b>46</b> |

|   |  |              |
|---|--|--------------|
| 8.2.3   | Heraeus Quarzglas – Base Materials and Fabrication .....   | 47           |
| 8.2.4   | Momentive.....   | 47           |
| <b>8.3</b>  | <b>Quartz Base Materials .....</b>   | <b>48</b>    |
| 8.3.1   | Heraeus Quarzglaz – Crucibles, Base Materials and Fabrication.....                                 | 48           |
| 8.3.2   | Heraeus / Shin-Etsu Quartz Products – Fabrication and Base Materials .....                         | 49           |
| 8.3.3   | Momentive – Crucibles and Base Materials .....   | 49           |
| 8.3.4   | TOSOH Quartz Corporation - Base Materials and Fabrication.....                                     | 50           |
| 8.3.5   | QSIL GmbH Quarzschemelze limenau - Base Materials Europe .....                                     | 50           |
| 8.3.6   | Hubei Feilihua Quartz Glass Co., Ltd - Base Materials.....   | 51           |
| 8.3.7   | JNC Quartz - JinZhou New Century Quartz Group - Base Materials.....                                | 51           |
| 8.3.8   | Donghai Pacific Quartz Products Co., Ltd – Base Materials China .....                              | 52           |
| 8.3.9   | Taicang Huaan Quartz Glass Product Co., Ltd. – Base Materials and Intermediate<br>Fabricator ..... | 52           |
| <b>8.4</b>  | <b>Quartz Components Fabricators .....</b>   | <b>53-90</b> |
| Shin-Etsu Quartz/Heraeus-Shin-Etsu Quartz Products (HSQP) |  |              |
| Heraeus Quarzglas   |  |              |
| Tosoh Quartz  |  |              |
| Wonik Quartz  |  |              |
| Ferro Tec   |  |              |
| Hayward Quartz Technology, Inc.                           |  |              |
| Techno Quartz Inc.  |  |              |
| Kumkang Quartz  |  |              |
| Hubei Feilihua Quartz Glass Co., Ltd                      |  |              |
| Xycarb Ceramics   |  |              |
| Worldex/West Coast Quartz                                 |  |              |
| Topco / Heraeus in Taiwan                                 |  |              |
| XingHu Shanghai   |  |              |
| Jinzhou New Century Quartz                                |  |              |
| Donghai Pacific Quartz Products                           |  |              |
| LTD Material  |  |              |
| GM Associates   |  |              |
| SungRim   |  |              |
| DS Techno   |  |              |
| Taicang Huaan Quartz Glass Product Co., Ltd.              |  |              |
| HanYung   |  |              |
| Young Shin  |  |              |
| Beijing Kaide   |  |              |
| Huzhou DongKe   |  |              |
| Hantek  |  |              |
| Quick Gem Optoelectronic S & T Co., Ltd.                  |  |              |
| Donghai Baosheng Quartz Products Co., Ltd                 |  |              |
| Quality Quartz Engineering                                |  |              |
| Hangzhou Dahe Thermo-magnetics Co., Ltd                   |  |              |

## List of Figures

|  | page # |
|--|--------|
| Figure 1: Quartz Powder Market Share .....   | 7      |
| Figure 2: 2014-2015 Quartz Base Materials Market Share by Supplier.....                                  | 8      |
| Figure 3: 2014-2015 Fabricated Quartz Components Market Share by Supplier .....                          | 9      |
| Figure 4: Wafer Start History and Forecast by Device Technology Node .....                               | 11     |
| Figure 5: Quartz Products for Semiconductor Applications .....   | 13     |
| Figure 6: Quartz Powder Market Share .....   | 14     |
| Figure 7: Arc fusion for Producing a High-Purity Quartz Crucible .....                                   | 16     |
| Figure 8: High-Purity Quartz Crucible with Synthetic Quartz Inner Layer.....                             | 16     |
| Figure 9: Crucible Revenue History and Forecast (unit: \$M'S) (For Semiconductor Application Only) ..... | 18     |
| Figure 10: 2014 Quartz Crucible Market Share by Supplier .....   | 19     |
| Figure 11: 2014 Quartz Crucible Market Share by Crucible Manufacturing Region.....                       | 19     |
| Figure 12: Pulling a 450-mm Silicon Ingot.....   | 20     |
| Figure 13: Electric Fusing Method .....  | 21     |
| Figure 14: Quartz Tubes.....   | 22     |
| Figure 15: Quartz Rod.....   | 22     |
| Figure 16: Quartz Plate .....  | 23     |
| Figure 17: Quartz Ingot.....   | 24     |
| Figure 18: Base Materials Revenue History and Forecast (Unit: \$M's) .....                               | 25     |
| Figure 19: 2014-2015 Quartz Base Materials Market Share by Supplier.....                                 | 26     |
| Figure 20: Ingot Market Share 2014-2015.....   | 27     |
| Figure 21: Rod/Tube Market Share 2014-2015 .....   | 27     |
| Figure 23: Batch Systems Market Share.....   | 29     |
| Figure 24: Single-Wafer Systems Market Share .....   | 29     |
| Figure 25: Fabricated Quartz Components for Thermal Process .....  | 30     |
| Figure 26: Thermal Process Components Material (Qty) .....   | 31     |
| Figure 27: Dry Etching Systems Market Share .....  | 32     |
| Figure 28: Fabricated Quartz Components for Dry Etching Process.....                                     | 32     |
| Figure 29: Dry Etching System Component Materials (Qty).....   | 33     |
| Figure 30: Plasma CVD Systems Market Share .....   | 34     |
| Figure 31: Epitaxial Reactor Systems Market Share.....   | 35     |
| Figure 32: Fabricated Quartz Components for Batch Epitaxial Process .....                                | 36     |
| Figure 33: Fabricated Quartz Revenue History and Forecast (Unit: \$M's) .....                            | 37     |
| Figure 34: 2014 Fabricated Quartz Components Market by Supplier .....                                    | 38     |
| Figure 35: Cold Work (SW) Fabrication Market Share (as a % of Total Revenues).....                       | 39     |
| Figure 36: Hot Work (Batch) Fabrication Market Share (as a % of Total Revenues)....                      | 40     |
| Figure 37: 2014-2015 Fabricated Quartz Components Market Share by End Use Market .....                   | 41     |

## List of Tables

|   | page # |
|---|--------|
| Table 1: Crucible Revenue History and Forecast .....                                    | 17     |
| Table 2: Base Materials Revenue History and Forecast* .....                             | 24     |
| Table 3: Wafer Process Tool Types and Their Quartz Components .....                     | 28     |
| Table 4: Replacement Cycle and Estimated Price of Focus Rings.....                      | 34     |
| Table 5: Fabricated Quartz Components Revenue History and Forecast* .....               | 37     |
| Table 6: Fabricated Quartz Components Supplier Ranking by Region .....                  | 41     |
| Table 7: Typical Sizes of Tubes and Boats for 200-mm, 300-mm, and 450-mm furnaces ..... | 42     |
| Table 8: Major Players in Quartz Sand Market .....                                      | 43     |
| Table 9: Quartz Fabricators .....   | 43     |