Recommendations for Grade BN-1250 Processing at 1150°C

PDS® Products grade BN-1250 planar diffusion sources were introduced thirty-five years ago for high temperature depositions. The original use instructions included:

• Periodic reoxidation to replenish the reservoir of B₂O₃.
• Periodic re-etching to expose fresh boron nitride.
• Use 100% nitrogen during the deposition process to avoid excessive oxidation of the source.

Recently, we reexamined these recommendations, using the PDS Products Class 100 Cleanroom. As a result we have developed new instructions for use of BN-1250. Diffusion processing now includes the use of 1% oxygen during the soak step.

The benefits are:

• Eliminate periodic reoxidation and re-etching.
• A more uniform and stable Sheet Resistance.

Typical BN-1250 Diffusion Process outline at 1150°C with Oxygen:

BN-1250 processing using 1% O₂ during the soak interval resulted in 80 cycles with only 1/4 ohm/sq increase in sheet resistance. This is shown below:
Boron Glass Thickness

Measuring the thickness of the deposited boron glass layer (Tgf) on the silicon wafer is a key aspect to optimum PDS Products performance. The information gained can be used to determine the condition of the PDS Products solid source wafer.

Refer to the guidelines in the next page for processing BN-1250 with oxygen:

<table>
<thead>
<tr>
<th>Silicon Tgf</th>
<th>Risk</th>
<th>Symptom</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1200Å</td>
<td>Excess Boron Glass / Dopant Source Over Oxidation</td>
<td>Source Wafers Warping &amp; Sticking to Carrier Rapid Tgf increase over source lifetime</td>
<td>Continue to monitor Tgf Decrease O2%</td>
</tr>
<tr>
<td>400Å - 1200Å</td>
<td>None – Optimum Performance Range</td>
<td>Good Rs uniformity Slight Tgf increase over source lifetime</td>
<td>Continue to monitor Tgf</td>
</tr>
<tr>
<td>&lt; 400Å</td>
<td>Not enough dopant to support diffusion</td>
<td>Unable to reach target Rs Poor Rs Uniformity</td>
<td>Continue to monitor Tgf Increase O2% Incorporate an additional 1% O2 during the ramp interval</td>
</tr>
</tbody>
</table>

Summary

New recommendations for BN-1250 diffusion processing are to include 1% O2 during the soak step. This will continue to develop B2O3 supporting uniform and consistent diffusion while minimizing silicon damage and the need for frequent reoxidation.

This document is part of a continuing effort to provide current processing information. New data will be added as it is developed.

For further information, or specific processing recommendations, please visit us at www.bn.saint-gobain.com, or contact your PDS Products specialist at bnsales@ saint-gobain.com

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