SEMI-FINISHED BONDED SUBSTRATES CONSISTING OF PIEZO- AND PYROELECTRIC LITHIUMTANTALAT AND GLASS

Materials
Fraunhofer ENAS uses lithium tantalate and glass for the fabrication, which are common and available on the market.

Lithium tantalate:
- Type: \( \text{LiTaO}_3 \)
- Thicknesses range from 250 to 500 µm
- Coefficient of thermal expansion in \( 10^{-6} \cdot \text{K}^{-1} \): 18.3
- Refraction index: \( n_e = 2.179 \), \( n_r = 2.182 \)
- Dielectric constant: \( \epsilon_a = 53.6 \), \( \epsilon_c = 43.4 \)
- Main characteristics: piezo- and pyroelectric materials, directly bondable

Glass:
- Type: Borofloat®, Foturan®
- Thicknesses range from 150 to 3000 µm for Borofloat® and 150 to 1200 µm for Foturan®
- Coefficient of thermal expansion in \( 10^{-6} \cdot \text{K}^{-1} \): 3.25 for Borofloat® and 8.6 for Foturan®
- Refraction index: \( n_e = 1.471 \), \( n_r = 1.515 \)
- Electrical Resistance in Ω·cm: > 10⁷ for both types
- Dielectric constant: 4.6 for Borofloat®, 6.5 for Foturan®
- Main characteristics: anodic and directly bondable, coefficient of thermal expansion adjusted to Si, photosensitive glass, isotropic and anisotropic etching, directly bondable

Dimensions
Fraunhofer ENAS produces these semi-finished bonded substrates with diameters of 4” and thicknesses from 300 µm up. The precise specifications of each wafer have to be determined specifically, depending on the intended application.

- Diameter: 4”
- Thickness range: from 300 µm up
- Device layer thickness: from 10 µm up
- Edge geometry: With special bondgap removal (Edge-Grind)
- Total thickness variation (TTV): 5 … 20 µm
- Warp: \( \leq 100 \text{ µm} \) depends on the wafer diameter

Surfaces
Fraunhofer ENAS offers these semi-finished bonded substrates with either ground or polished surfaces as required. The surface texture can be selected depending on the intended application (bonding, etching, need for hydrophobic or hydrophilic surfaces etc.). With specially developed polishing techniques low surface roughness can be achieved within Angström range. The combination of polished and ground surfaces within semi-finished bonded substrates is possible.

<table>
<thead>
<tr>
<th>Polished surfaces</th>
<th>Ground surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness</td>
<td>( R_s &lt; 0.5 \text{ nm} )</td>
</tr>
<tr>
<td>Availability</td>
<td>Single- and double-sided</td>
</tr>
<tr>
<td>Application</td>
<td>Direct bonding and etching</td>
</tr>
</tbody>
</table>

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