

Novel MCz-Silicon Material and Applications for the Radiation Detection Community

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Magnetic Czochralski (MCz) silicon wafers have been successfully employed in sensor applications for high-energy physics, space and medical applications. It is known to have a superior radiation tolerance and robustness compared to Float-Zone (FZ) silicon and better availability. On the other hand, the higher oxygen concentration of the material can lead to the generation of Thermal Donors (TD's) in the sensor processing steps under certain conditions. Those TD's change the resistivity of high-resistivity material and can only be dissolved by high-temperature annealing steps.

Okmetic Oyj has a long tradition in the fabrication process of MCz wafers and is dedicated to developing new crystal pulling techniques in order to offer ideally suited materials for respective applications.

We have developed a new Advanced-MCz material with resistivities above $5 \text{ k}\Omega \text{ cm}$ and an oxygen concentration ranging from $1 \times 10^{17} \text{ cm}^{-3}$ to $2.5 \times 10^{17} \text{ cm}^{-3}$. This material still offers the beneficial properties of oxygen-rich MCz but has a reduced probability of generating TD's. The material will be very robust for thermal cycles in the sensor processing steps but still feature the positive properties of MCz.

In this overview, we will present the simulated generation of TD's for different temperatures, material properties like IR-absorption spectra in comparison to other Si-materials and wrap up some applications which might be interesting for the detector community.

TRACK

Technology

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