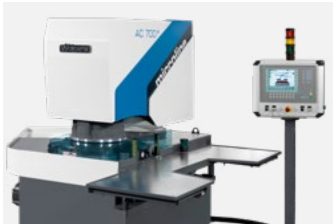
PUREON

**Electronics & Semiconductors**

Case study

# High quality SiC polishing

SiC wafer



AC700 Lapmaster Wolters

**Achievements** Eliminate SSP, reduce CMP process time, reduction of rejected wafers.
⟶ Reduced cost per wafer.

| | |
|---|---|
| **Business sector** | Electronics & Semiconductors |
| **Application** | Lapping and polishing of SiC wafer |
| **Workpiece material** | 4 inch SiC wafer |
| **Contact** | Mr. Helge Willers, hwillers@pureon.com |
| **Date** | Sep. 19, 2020 |

## Conclusion

The reduction from 5 to 4 process steps has positively impacted the total process time. In respect to the lithography process step the TTV requirements have been fully achieved.

## Workpiece and equipment

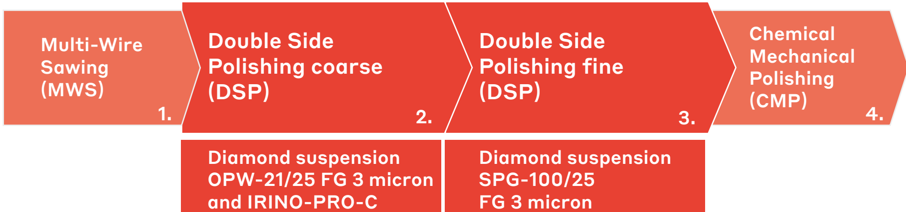
Material ........ Silicon carbide
Dimensions ........ 4 inch
Machine, plate diameter ........ Double side lapping/polishing machine, Lapmaster Wolters (AC700 & AC1200)

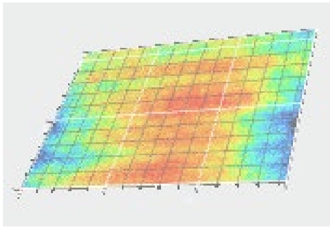
## Process description and data

**Previous process**

Eliminated Step

**New improved process**




3D view of polished SiC wafer

Roughness profile

**Wafer geometry**
Wafer diameter 4 inch
Bow +/- 15 micron
Warp 20 micron
TTV 2 micron
LTV max 10 x 10 mm 40 micron

## Process data, machine parameters

**Step 2**

| Double Side Polishing (coarse) | Ra (nm) | Rz (nm) | MRR (µm/min) | Cycle time (min) | RPM (c/m) | Pressure (kg/cm2) |
|---|---|---|---|---|---|---|
| OPW-21/25 FG3 | 5 ± 1 | 43 ± 14 | 3.4 | 40 | 50 | 0.25 |

The main issue of this process is to remove unevenness from wire-sawing, and to generate perfect wafer geometry (in terms of TTV, bow, warp). The new copper-composite plate IRINO-PRO-C allows to achieve high material removal rates, and very fine surface quality in respect to Ra at the same time. In combination with the diamond suspension is OPW-21/25 FG 3 micron a material removal level of as high as 3.4 µm/min, while a surface quality of Ra = 5 nm is created! As well the subsurface damage is not further increased, but already stepwise reduced.

**Step 3**

| Double Side Polishing (fine) | Ra (nm) | Rz (nm) | MRR (µm/min) | Cycle time (min) | RPM (c/m) | Pressure (kg/cm2) |
|---|---|---|---|---|---|---|
| SPG-100/25 FG3 | 0.8 ± 0.1 | 5 | 0.11 | 40 | 20 | 0.16 |

This step uses diamond suspension SPG-100/25 FG 3 micron on polyurethane (PU) pad MHN15A. With a material removal rate of 0.11 µm/min this process creates a very regular surface as fine as Ra = 0.8 nm +- 0.1 nm and Rz = 5 nm ± 1 nm. Because Rz is just 5 nm, and the deviation is very low, it is easy to do CMP polishing afterwards. Rz as description of the real depth of the profile is the indication, of how much needs to be remove in order to get CMP quality.

## Additional remarks

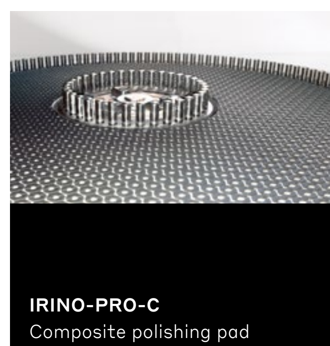
– Pureon offers diamond suspension for multi-wire-sawing. The related product is the WSG-52/250 MONO-ECO 3-6 micron. The present case study focusses on the DSP processes.

– Pureon is currently developing an appropriate solution for the CMP process step. This will allow to cover solutions for the whole wafering process.

– CMP processing time can be exponentially reduced with lower Ra incoming wafer.

## Pureon products used

**OPW-21/25 FG 3 micron**
**SPG-100/25 FG 3 micron**
Diamond suspensions


**IRINO-PRO-C**
Composite polishing pad