

## Gas Purification for Czochralski (CZ) Puller Tools

Monocrystalline silicon solar cells are built on wafers sliced from silicon ingots. The ingots are grown inside a CZ puller tool that uses argon as the inert blanket gas. Although high-purity argon is used in the solar industry, there are some molecular contaminants present in the form of moisture (H<sub>2</sub>O), oxygen (O<sub>2</sub>), and hydrocarbons. Typical inlet impurity levels are 0.5 ppm moisture, 2 ppm oxygen, and 0.4 ppm total hydrocarbons. These contaminants are carried into the CZ puller tool and can become incorporated within the silicon crystalline structure, forming Si-O, Si-H, and Si-C bonds. Contamination must be kept at extremely low concentrations in the argon process lines to prevent these crystalline defects.

### Crystalline defects from impurities add costly processing step

When crystalline defects in the ingot appear during the growth process, remelting is necessary to remove them. This is costly because it lengthens the growth process, negatively impacting tool throughput.

### Purifiers containing INP medium remove defect-causing contaminants

Removal of moisture, oxygen, and hydrocarbons to trace levels can reduce or eliminate crystalline defects and the necessity for remelting. A Pall purifier containing INP medium, installed in the argon gas line upstream of the CZ puller tool, can remove these impurities. Testing with an atmospheric pressure ionization mass spectrometer (APIMS) has demonstrated that the Pall purifier can remove moisture, oxygen, carbon dioxide, carbon monoxide and n-butane to < 1 part per billion (ppb). (See Figures 1 and 2.)

### Pall recommends Gaskleen® purifiers for CZ puller tools

Gaskleen purifiers with INP medium are ideally suited for CZ puller tools and offer the following benefits.

- Inorganic substrate provides good stability during operation.
- Room temperature operation eliminates the need for heating or cooling sources.
- Small, uniform substrate allows for good packing characteristics and accurate service life estimation.

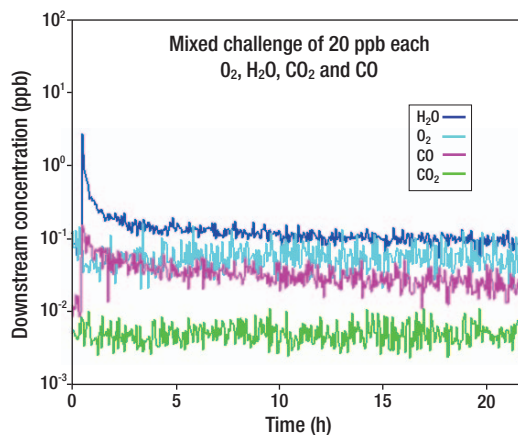


Figure 1. Removal of oxygen-containing compounds by Gaskleen® II purifier

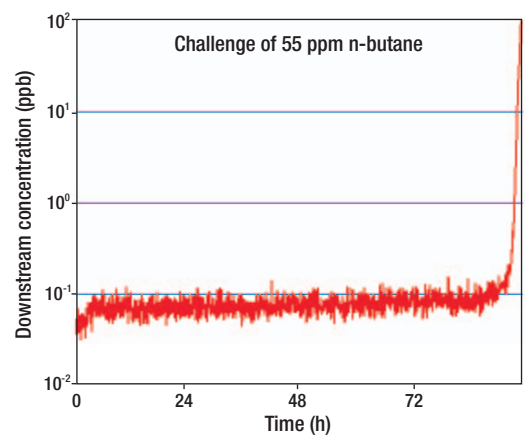


Figure 2. Removal of carbon-containing compound by Gaskleen® II purifier



PG550 Series Gaskleen purifier

**PG550 Series Gaskleen purifier  
(part no. GLP9INPFVMM8)**

- Rated for 75 slpm
- ¼ in gasket seal (VCR\* compatible) fittings
- Assembly includes integral 3 nm particle filter
- Bypass manifold option available



PG2400 Series Gaskleen purifier

**PG2400 Series Gaskleen purifier  
(part no. GLP24INPFVMM8)**

- Rated for 300 slpm
- ½ in gasket seal (VCR compatible) fittings
- Assembly includes an integral 3 nm particle filter
- Bypass manifold and refill options are available

The product data sheet is available for download from the Pall Corporation Website at <http://www.pall.com/pdf/MEPGGPEN.pdf>

\* VCR is a trademark of Swagelok Co.



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