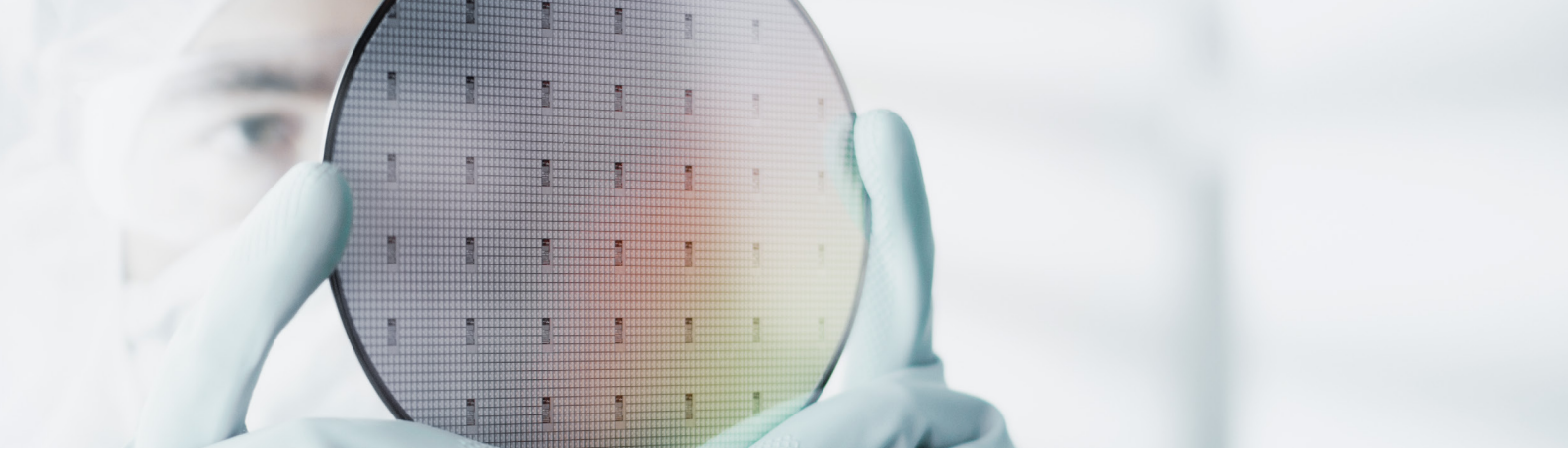
WAFERING PROCESS

Photovoltaic (PV) energy uses the solar energy to create electricity. The PV modules – this is a series of connected PV cells – converts the solar energy into electric current, see Figure 1.

PV modules consist of many so-called wafers, which are thin slices (~0,15 mm thickness) of various semiconductor materials with an extremely flat surface. The most common material used for wafers today is silicon.

Silicon wafers are an essential basis for the world's electronics industry. Silicon is the second most common element in the earth's crust; however, it is only present in the form of oxides. To produce crystalline silicon, the oxides have to be heated up to high temperatures and reduced with carbon-based materials.

Figure 1: Generation of electricity via solar energy



WAFERING PROCESS

The wafering process (Figure 2) starts with the growing or casting of solid ingots made of single-crystal or multi-crystalline silicon.

» Multi-crystalline silicon ingots are made by melting a load of silicon chunks within a furnace followed by a slow cool down.

Mono-crystalline ingots are grown by using the Czochralsky process: silicon chunks are put in a circular crucible and molten and additionally, a small crystal seed is entered into the molten pool of silicon, see Figure 3.

The ingots then are cut into squared blocks, either with a band saw, or with a kind of wire saw machine.

» The silicon blocks then are further sliced into thin wafers by using Multi-Wire Saw technology (MWS).

Here, the saw wire is pulled over the wire guide rollers in such a way that a wire web is spanned. This technology is applied in diamond wire cutting (up to ≥ 40µm) and slurry cutting likewise. The cutting fluid – the so-called slurry – is applied to the wire web while the silicon block is slowly pushed through it.

By using this technology, it is possible to slice one silicon block into hundreds of wafers in just one process step, see Figure 4.

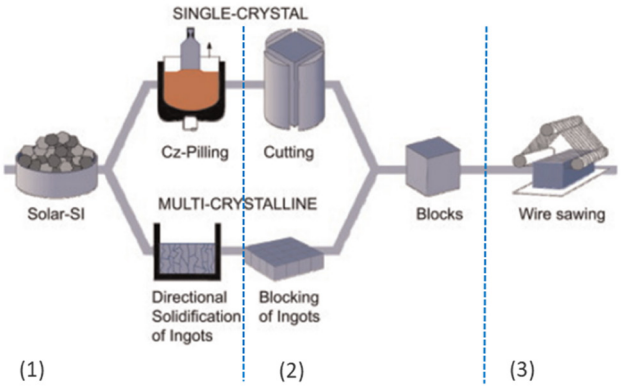


Figure 2: Typical process flow in the production of silcon wafers[1]

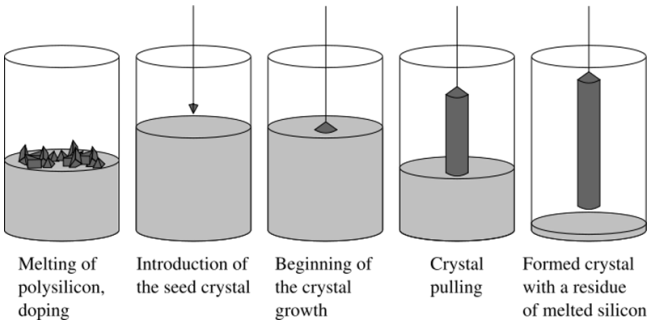


Figure 3: Czochralski Process[2]

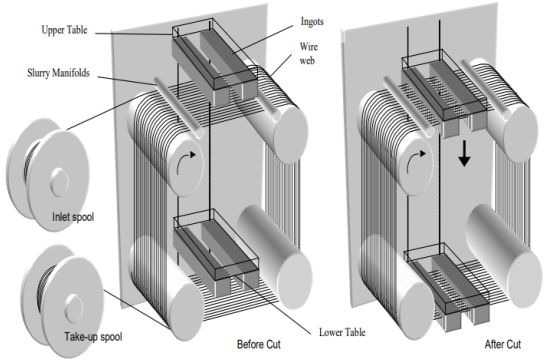


Figure 4: Schematic of a multi-wire saw. Silicon blocks are passed through the web of cutting wires.[3]

[1] Zhang L and Ciftja A (2008); Recycling of solar cell silicon scraps through filtration. Part I: experimental investigation. Solar Energy Materials and Solar Cells 92: 1450–1461.
[2] https://de.wikipedia.org/wiki/Datei:Czochralski_Process_DE.svg
[3] Applied Materials, Advanced Wire Sawing Technology for Solar Photovoltaic Cells., Whitepaper

WAFERING PROCESS

How do our products stand out from those of the competition?

- From ore to wire from one single source. Thus, maximum flexibility in all process steps.
- Products developed on a customized basis to meet the highest requirements
- Consistent and uniform tensile strengths
- Worldwide operation with the necessary logistics
- The best winding technology available, therefore high unwinding speeds
- Environmental friendly and most advanced production facilities
- Local sales hubs
- Pioneering wire solutions for the energy transition

Product portfolio Saw wires

Specifications

Diameter (µm)	Breaking load up to (N)	Appearance
40	5,5	
45	7,5	
50	9,5	
95	26	Structured
115	35	Structured
120	44	
130	50	
130	45	Structured
140	55	
145	58	
160	74	
160	64	Structured
175	82	
175	79	Structured

Surface

- Standard surface is brass coated or bare

Quality Control

- EN ISO 9001:2008

For detailed information regarding our certifications, visit our webpage www.voestalpine.com/wire

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