

Location of the infrastructure :

Trondheim, Norway

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Objectives :

- Silicon crystallization, including multicrystalline and monocrystalline silicon

Main features :

- We are operating two induction heated furnaces for customized directional solidification of silicon, the Crystalox DS-250 and a Cyberstar PV-furnace.

1.Crystalox DS-250

- Located in a class 10 000 clean room
- 12 kg cylindrical ingots, diameter 250 mm, height 105 mm
- Heat extraction combining various techniques
- Possibility for different crucible rotation patterns, taking melt samples/adding material to melt
- Micro-GC for online melt atmosphere measurements
- In-house developed control and data acquisition software

2.Cyberstar PV-furnace

- Gen. 3, up to 120 kg, square 550 mm x 550 mm ingots
- Independently controlled upper and lower heaters
- Possibility for mounting electromagnetic stirrer and adding material during/after melting, taking melt samples



- We operate two Czochralski pullers for customized crystallization of solar grade silicon, one FerroTec CZ2208 and one small Cz puller
 1. FerroTec CZ2208
 - Hot zone for 20" crucibles
 - Up to 6" ingots (8" in near future)
 - Up to 120 kg charge weight
 2. Small Cz
 - 15 kg cylindrical crystals, diameter 4 inch
 - Hot zone for 12 inch crucibles
 - In house developed software with data acquisition
 - Various furnace tanks and lids allows for flexibility and new development



- Modelling of Si casting: our focus is to understand, design and optimize processes for the production of high quality silicon ingots (mono- and multi crystalline). Thorough validation of the models is based on the close interaction with experimental activities.

Limitations or constraints :

For the crystallization the experiments will be carried out by SINTEF.

Typical services or results :

- Testing of silicon feedstock
- Testing of additions to feedstock, either before charging or later in the run
- Testing of crucible and coating material
- Tracing of impurity elements and their distribution in the ingot
- Recharging
- P- and n-type
- Control of defect formation
- Semi continuous casting
- Addition of elements and dopants
- Hot zone development
- Oxygen control

Examples of research projects :

Experiments and modelling to understand and optimize the process for crystallization of ingots (mono- and multi crystalline)