

Crystal Growth

CCZ FEEDER ENABLES LOW LID MONO-SI SOLAR CELLS PRODUCTION

The GT Advanced Technologies' CCz feeder technology converts a traditional Cz crystal puller to an advanced continuous Cz puller enabling higher throughput, higher yield and lower cost production of monocrystalline ingots with low segregation coefficient dopants (gallium, phosphorus, etc). Solar cells fabricated on boron doped p-type mono silicon wafers suffer high light induced degradation (LID) and the output power loss becomes more severe for advanced, high efficiency solar cells such as PERC. Replacing boron by gallium can solve the LID issue from the material level eliminating any long term concern for power loss. Compared to the state of the art puller with multiple pulls per run, after converting to CCz, the throughput can be increased by 15%, the crystal yield can be increased by at least 10% and the operating cost can be decreased by 15%. Furthermore, CCz technology can support increasing ingot length without the need to increase crucible and hotzone size accelerating the cost reduction for mono-Si wafers. The tunable ingot resistivity target and the extreme uniform distribution also increase average cell efficiency, reduce the need to tune the cell process for different resistivity and reduce the cell binning for the module production.

GT Advanced Technologies is committed to delivering sustained value to customers and the CCz feeder delivers on this promise. Customers who operate Cz pullers with main chamber diameter of 1 meter or larger can upgrade their pullers to take advantage of the continuous Cz technology.

Key Product Advantages:

- Gallium or phosphorus doping with tunable resistivity target and uniform distribution
 - Higher Ingot yield
 - Higher average cell efficiency
 - No additional cell process tuning for different wafer resistivity
 - Reduced cell binning requirement for module production
- 15% higher production throughput
- Uniform and low oxygen concentration increasing cell efficiency
- Support pulling ingots of increased length without needing larger crucible and hotzone



GT Advanced Technologies' unmatched expertise in crystal growth processes, mechanical design, vacuum and high-pressure chambers, control system design, and crystal growth modeling, provides customers with a technologically advanced system.

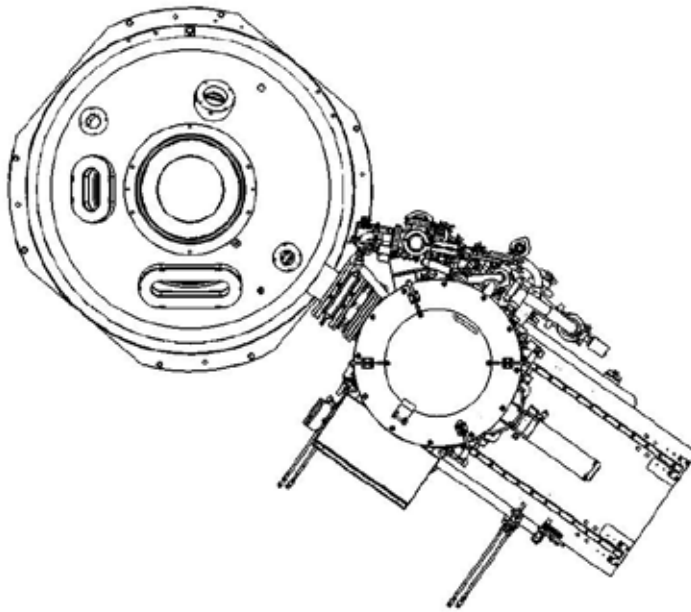
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Lower the Cost of Wafer Operations

CCz feeder technology lowers the wafer production cost by increase the throughput of Cz puller and the yield for Ga and P doped ingot. CCz feeder technology also enables pulling long ingots without increasing the crucible and hotzone size lowering the operation cost.

Typical System Dimensions and Utility Requirements

- Dimensions: W x L x H 1100 mm x 2000 mm x 4000 mm
- Weight approx. 1950 kg
- Power 400VA, 100-250V, 50/60 Hz
- Cooling water
- Argon
- Vacuum



About GT Advanced Technologies

GT Advanced Technologies is a diversified technology company producing innovative crystal growth equipment for the solar PV and power electronics industries, and sapphire material for precision optics and other specialty industries. The company's technical innovations accelerate the use of advanced materials, enabling a new generation of products across this diversified set of global markets.

[Learn more at www.GTAT.com](http://www.GTAT.com)

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