

## Company Profile

### Company Name /

Pan Solution Technologies Co., Ltd.

### Address /

Tohoku University Business Incubator T-Biz 205,  
6-6-40 Aza Aoba, Aramaki, Aoba-Ku, Sendai, Miyagi 980-8579, Japan

### TEL /

+81-22-216-7155

### FAX /

+81-22-216-7156

### President & CEO /

Satoru Matsushima

### Establishment /

September 2017

### Capital Stock /

67.75 million yen

### Business Description /

- Manufacture and sale of materials for solar cells and material inspection equipment for semiconductors
- Consulting and licensing business of materials for solar cells and material technology for semiconductors
- Manufacture and sales of materials for solar cells and semiconductors

## ACCESS



Take a subway bound for Yagiyama Animal Park from Sendai Station on Tozai Line. Get off at Aobayama Station and it takes 2 minutes from South Exit 1 by foot.



From Sendai Station, indicate the destination as "Tohoku University New Industry Creation Hatchery Center (NICHe)". T-Biz is next to NICHe. The ride time is about 15 minutes.

※There is no visitor parking lot in T-Biz. Please use public transportation as much as possible.

※Please use the shared parking lot at Aobayama New Campus if you visit by car.

<https://psts.jp>

SOLUTION FOR  
THE CRYSTAL TECHNOLOGY



Pan Solution  
Technologies

COMPANY PROFILE

# Pan Solution Technologies

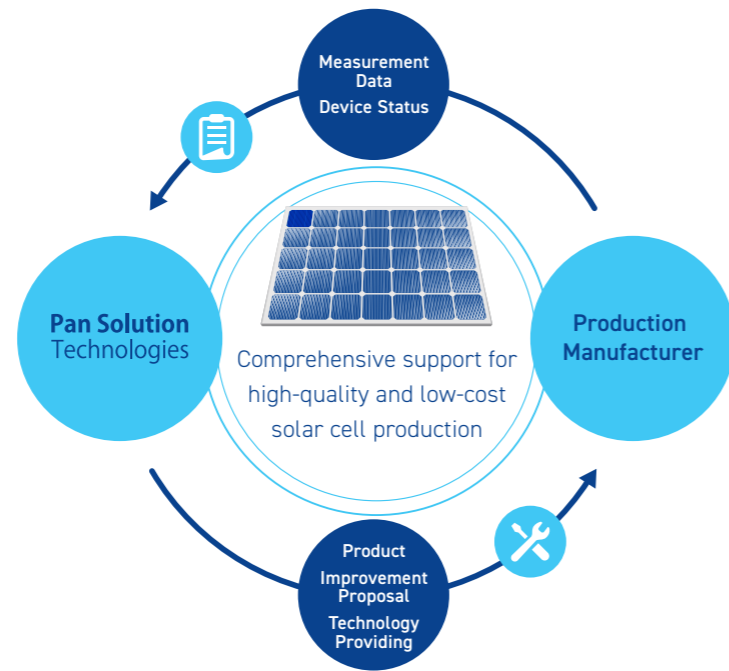
株式会社パンソリューションテクノロジーズ | 会社案内

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We provide new solutions for quality measurement technology of semiconductor crystal.

Solar cell has made remarkable progress as a core technology for the next-generation energy. Further spread of solar power generation, quality improvement and price reduction are required for solar cell. For this solution, we are confident a new wafer quality standard is urgently needed, which is a new measurement of HS-CMR developed at the Institute for Materials Research, Tohoku University, Japan. The HS-CMR method can accurately measure and standardize a wafer before conversion into cell in the process of manufacturing a solar cell and thereby the quality of the cell is stabilized, and the cost can be reduced. In addition, the HS-CMR method is an extremely versatile measurement technology that can be applied not only to wafers for solar cells, but also evaluation measurement of any semiconductor crystal. Our company name Pan means "All" in ancient Greek. We provide new solutions with HS-CMR method that can be applied to all semiconductor crystals quality measurement and contribute to the development of future technologies.

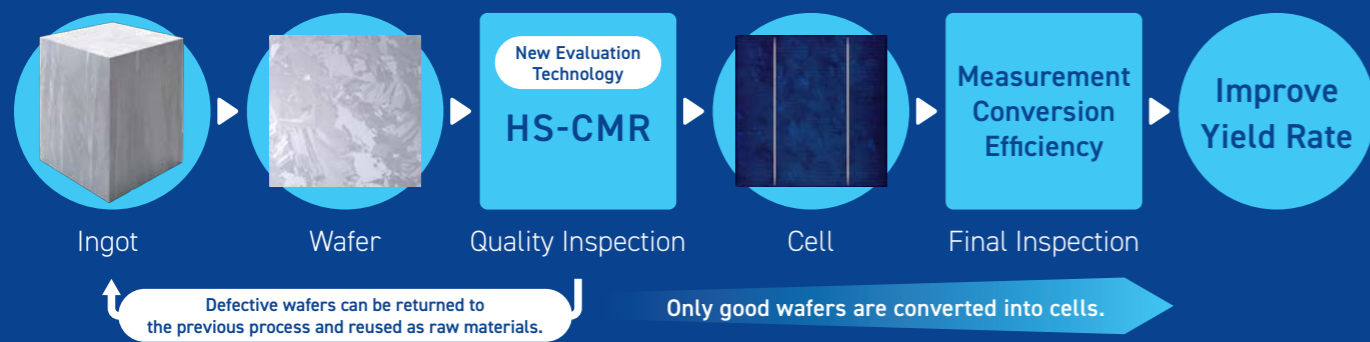


Introduction Example

## Quality inspection before conversion into cell (Solar cell)

Quality judgment in the current solar cell production process, measures the conversion efficiency of the cell after all cell processing is completed. With our HS-CMR method, quality can be accurately obtained at the wafer stage, thereby low-quality wafers can be eliminated before wafers are converted into cells. As a result, waste of cell process can be greatly reduced and the yield rate can be improved.

### Effects of introducing new measurement technology

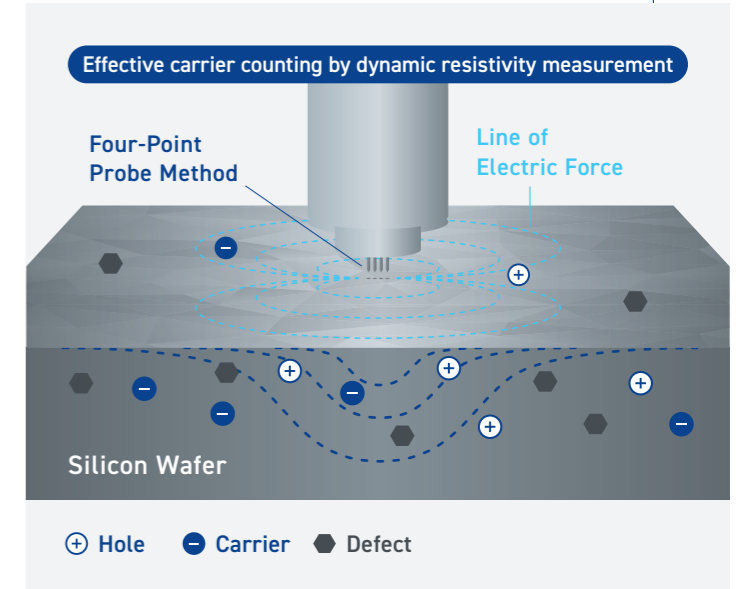


RESULT

With the current inspection method, all defective wafers must be disposed. However, by performing HS-CMR highly accurate quality inspection at the wafer stage, defective wafers can be reused as raw materials and therefore the amount of waste can be reduced.

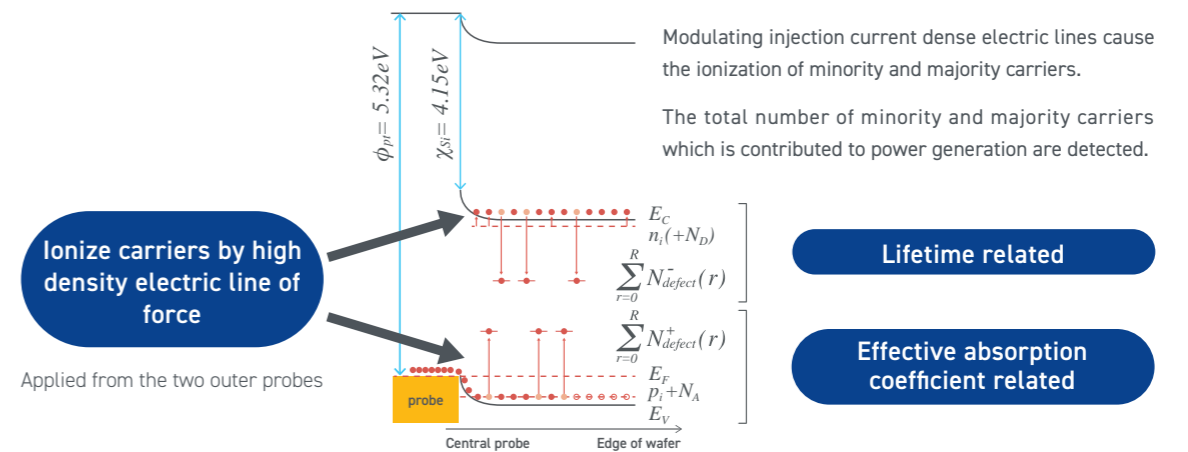
Unique technology for measuring effective carrier number by dynamic resistivity measurement.

The HS-CMR method is a new crystal quality measurement technology developed from the Institute for Materials Research, Tohoku University. The HS-CMR does not use carrier lifetime mapping or diffusion length mapping that has been used in the past, and has been designed by comprehensively considering various problems caused by the thermal processes of semiconductor crystal wafers and subsequent device manufacturing processes. The HS-CMR method uses the four-point probe method to measure the resistivity while changing the current with our own proprietary algorithm. With this method, the HS-CMR method can measure the "effective resistivity". The effective resistivity is a value that reflects the total number of minority carriers and majority carriers that are not trapped by crystal defects or impurities. The HS-CMR method can obtain a single quality factor that accurately reflects the quality of the wafer by comprehensively analyzing the transition of the resistivity and the effective resistivity. The measured values obtained by the HS-CMR method can be used to improve and develop crystal growth and device processes.



Modulating the injection current of four-probe, getting dynamic resistivity profile, calculating a single quality factor with surface quality and wafer thickness considered.

$$P_{effective} = \frac{1}{e \left[ \mu_n \left( \int_0^R 2\pi r_i (n_i + N_{Di}) dr_i - \sum_0^R N_{defect}^- (r_i) \right) + \mu_p \left( \int_0^R 2\pi r_i (p_i + N_{Ai}) dr_i - \sum_0^R N_{defect}^+ (r_i) \right) \right]}$$



## HS-CMR Effective Carrier Measurement Device for Silicon Wafer of Solar Cell VWECER-2500



Device Specification		Measurement Performance	
Size	W:950×H:950×D:1300 mm	Maximum Capacity	25 wafers (Cassette type/Continuously measuring capable)
Weight	200 kg	Measuring Method	Probe contact type
Power	Single-phase AC100 - 240V	Measuring Range	156×156×t0.2±0.05 mm
Operating Environment	Temperature and Humidity 25±5°C・≤85%RH	Measuring Object	p/n type Monocrystal・Polycrystal