Solar Thermal Collectors for Water Heating

Solar thermal collector is a major component for solar water heating system that can meet heat demand from residential and commercial buildings. Solar thermal collectors can be mainly classified by flat plate collectors and evacuated tube collectors. Solar thermal collector application technology is the core technology for solar active house.

[Fig 1] Vertically-installed facade-integrated flat-plate solar collectors
[Fig 2] Absorber-adjustable evacuated heat-pipe solar collector installed on the roof of a house

Key Technologies

- Building-integrated large area flat-plate collectors and its building integrated applications.
- Near-horizontal heat pipe evacuated solar collectors and its building integrated applications
- Hybrid packaged solar and ground-source heat pump thermal system
- Thermal performance testing (steady state and quasi-dynamic testing)

Applications

- Performance testing for solar collector certification
- Thermal system for water heating and space heating for buildings

Future Prospects

- Develop core technologies for low-energy solar active buildings and communities
- Harmonize with global testing laboratories for solar collectors

Renewable Resource Map System

RES-Map is a total solution for providing various functions for efficient use and management of renewable energy resources(solar, wind, small hydropower, biomass and geothermal). RES-Map is used for inspecting and analyzing the resources of renewable energy by means of high-tech technologies, such as GIS or remote sensing. It is a comprehensive technology for using latest IT fusion technology to produce useful energies from natural energies. This system can contribute to developing comprehensive and systematic renewable energy resources for national energy security and low-carbon green growth.

Key Technologies

- Measuring and analysing for renewable resources
- Monitoring and data management
- Mapping based on GIS*
- Assesment using a spatial information(LiDAR*, satelite images, etc.)

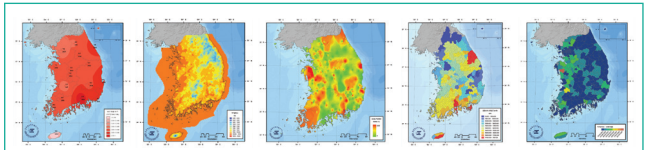
*GIS : Geographical Inforamtion system
*LiDAR : Light detection and ranging

Applications

- Establishment of renewable energy policies and dissemination plans
- Industrial use supporting production and management
- Energy market analysis
- Research data for studying renewable energy and other fields(disaster, aerology environment, etc.)

Future Prospects

- Assesment of energy potential for energy policy & research
- Energy resource(solar, wind) forecasting



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New and Renewable Energy Research
Climate Change Research
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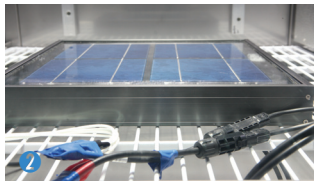
PV Module for Desert Application

- Desert area has climate condition of high temperature and high irradiance compared with other area. Especially PV system needs larger installation area other than renewable energy. So desert area are becoming new applicable zone for PV generation. But because of local climate hardness, we need to study and research the regin characteristics so that newly developed PV system can settle down on desert area.



[Fig 1] Accelerated test methods considering desert climate condition
[Fig 2] PV module for desert application

Key Technologies

- Performance characterization(high temperature, high irradiance condition)
- Durability analysis technology for high reliable desert PV
- Extracting climate condition of desert area
- Developing desert analyzing equipment

Applications

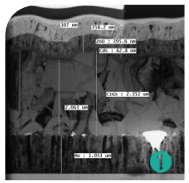
- Durability analyzing technology for desert area applicable PV
- Developing highly accelerated test methods considering desert climate condition

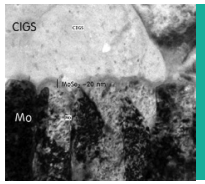
Future Prospects

- Becoming one of outstanding test laboratory for desert PV
- Having highly recognized international patents

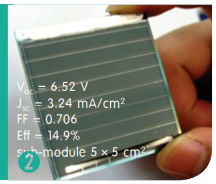
CIGS Thin Solar Film

- CIGS chalcopyrite compounds have a high light absorption coefficient (~105cm-1)and tunable direct band gap (1.0~2.4 eV) via controlling the In/Ga and S/Se ratios.
- Thin layers (1~2 μm) are enough to be used as an absorber in CIGS solar cell compared to well-known 100~300 μm thickness of crystalline Si solar cell on the market.





[Fig 1] TEM images of cross-sectional and interface in CIGS solar cell
[Fig 2] Cell and submodule image of CIGS solar cells



Key Technologies

- The world best CIGS efficiency via 3-stage co-evaporation system.
- A sputtering+selenization process for CIGS mass production
- Low-cost and rapid process via RTP and low temperature selenization
- Non-vacuum system for low-cost CIGS solar cell
- CZTS solar cell via low-cost and earth-abundant materials
- Wide band gap solar cell for Tandem structure
- Flexible substrate CIGS solar cells
- Non-toxic Cd-free Buffer
- R2R process for low-cost and mass production

Applications

- Application for very-large-scale PV system
- Application for building integrated solar system
- Application for solar car
- Application for portable/handy solar cell via flexible substrate

Future Prospects

Compared with traditional thermal/nuclear power,

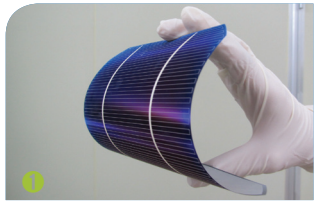
- Safe and environmental-friendly
- Cost-reduction of materials and labor costs after establishment
- Effective production via continuous study of conversion efficiency

KIER Ultrathin Crystalline Silicon Solar Cell (KUT cell)

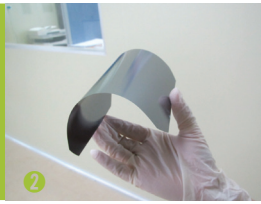
- Crystalline silicon solar cell remains the major player in the photovoltaic marketplace with 80% of the market in the world and >98% in Korea. At present, the 50 μm KUT cell is a promising way to maintain its position of dominance by reducing the cost.
- Saving the materials is essential to decrease the PV module cost.
- The PV manufacturing cost will be reduced by minimizing the kerf-loss in wafering and thinning the wafer from 200μm to 50μm.

Key Technologies

- Kerf-loss free ultrathin crystalline silicon wafer manufacturing technology
- High efficiency ultrathin crystalline silicon solar cell process and equipment development
- Ultrathin silicon PV module structure, process and equipment technology



[Fig 1] Thin crystalline silicon wafer
[Fig 2] Thin crystalline silicon solar cell



Applications

- Crystalline silicon wafer, solar cell and module manufacture
- Related materials technology and equipment business

Future Prospects

- Crystalline silicon solar cell market is expected to be expanded to 4 GW (2015), 10 GW (2020).
- The manufacturing cost for PV module will be reduced by > 50% with thinning the wafers, improving the conversion efficiency and throughput.
- The technology transfer will induce the dramatic cost reduction for c-Si PV module as well as import substitution and export enhancement.