



**Si Material**

**ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development**

**Realization line for high efficiency C-PV and small area cSi Solar Cells**

**Location of the infrastructure :** Portici, Italy <http://www.ene1.portici.enea.it/>

**Contact person :** Marco Dellanoce E-mail : [marco.dellanoce@enea.it](mailto:marco.dellanoce@enea.it)  
Phone : +39-081-7723300

**Objectives :** Realization of small area very high efficiency crystalline silicon solar cell (>20%) for PV Concentration application and specific applications

**Main features :**



The Research Infrastructure is based on the following equipments all installed in 100 class clean room except evaporators installed in 10000 class :

- three open tube quartz furnaces for diffusions, oxidations and annealing
- MA6 Karl Suss mask-aligner for photolithographic process and Girset Spinner
- Laser patter generator for the realization of photolithographic mask
- 2 Wet benches for RCA surface cleaning and chemical processing
- E-gun and thermal evaporator for deposition of metals (Ti/pd/Ag/Al) and oxide and dielectric (SiO<sub>x</sub>, MgF<sub>2</sub>, ZnS, Ta<sub>2</sub>O<sub>5</sub>)
- Rapid thermal processing and Furnaces for annealing treatments (T<sub>max</sub>=1200 °C)
- Very high efficiency small area solar cells (~1-2 cm<sup>2</sup>) suitable for concentration and other application were obtained with maximum efficiency of 22.0% at 30, 20.5% at 100X, and 20% at 200X

The lab also gives access to all characterization techniques on material and devices: Characterization tools: I-V<sub>dark</sub>/ light AM 1.5 G and under concentration up to 250 suns, external and Internal quantum efficiency with electrical and/or optical biasing, Minority carrier lifetime measurement of c-Si wafer by quasi-steady state and transient photoconductivity; spectrophotometer for direct and diffused cells and substrates reflectance; Spectral Elipsometry with variable incidence angle, fourpoint probe resistivity. E-SEM., AFM

**Limitations or constraints :** The access will be allowed with technical and scientific assistance from Enea starting from June 2012

**Typical services or results :** The structure is used by both researchers to realize specific samples for the development of innovative process step and characterization, and by students trained on realization and characterization of high efficiency cost effective solar cells.

**Examples of research projects :** The facility is currently used for many National and European FP EU.