

Processi, prodotti e servizi  
*Processes, products  
and services*

DII research group  
LEP



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## SIKELOR Electromagnetic Processing of Recycled Silicon in the i-DSS Furnace

The Laboratory for the Electroheat of Padova, LEP, is a research group of the DII working in the field of Electromagnetic Processing of Materials, EPM. EPM makes use of electromagnetic fields for material processing, like heating, melting or other treating. Depending on the specific application and material, the frequency of applied electromagnetic fields is ranging from DC (direct resistance heating) up to some hundreds of kHz (induction heating) or some MHz (radiofrequency heating) and GHz (microwave heating). In LEP, we have expertise in several applications of EPM, like melting and processing ferrous and non-ferrous metals, cooking foods, but we are also studying EPM as a clinic treatment for curing the cancer. We present a research project financed by EU that will exploit the technological features of the i-DSS furnace designed and manufactured by LEP. i-DSS is an induction vacuum furnace for the production of multi-crystal silicon used for the production of solar cells.

Silicon used for the production of solar cells is a highly pure material, expensive because its manufacture is high energy consuming. Up to 50% of this valuable resource is lost into sawdust during the sawing process of silicon ingots, mostly for slicing the wafers. SIKELOR, Silicon Kerfs Loss Recycling, is a project funded by EU for exploring innovative technologies to recycle silicon kerf losses.

The main problem is that Si particles are very small and the large surface-to-volume ratio (LSVR) causes formation of SiO<sub>2</sub> with a detrimental effect on the crystallization. Overheating, in combination with electromagnetic stirring (EMST), provides means to remove SiO<sub>2</sub>. Another problem is carbon introduced into the kerf in the form of diamond particles from the wire. Leenov-Kolin forces are an effective means to separate these electrically non-conducting particles from the conducting Si melt (EMSE = Electromagnetic Separation). In the i-DSS furnace, EMST and EMSE will be developed and tested.



<http://www.sikelor.eu/>

### SIKELOR project

#### Scientific Partners:

HZDR Helmholtz Zentrum Dresden  
Rosendorf (Germany).

University of Greenwich (United Kingdom),  
founded in 1891. UNIGW has a long history of  
collaborative research in manufacturing.

#### Industrial Partners:

Garbo s.r.l. (Italy) works on recycling of  
silicon carbide grits and polyol suspending  
agents from exhausted slicing slurries.  
EAAT GmbH (Germany) is an innovative  
SME specialized in designing and  
manufacturing of client-specific  
electrical equipment.

#### Main research topics:

- Main research topics
- Electromagnetic Processing of Materials
- Numerical Modelling and Optimization