Reducing the EU dependence on critical raw materials for solar panel production

RESiLEX Project - Technological solutions for reusing Silicon and recycling PV modules

The objective of RESiLEX is to improve the **resilience and sustainability** of the entire **Silicon value chain** and reduce EU dependence on critical raw materials for solar panel production.

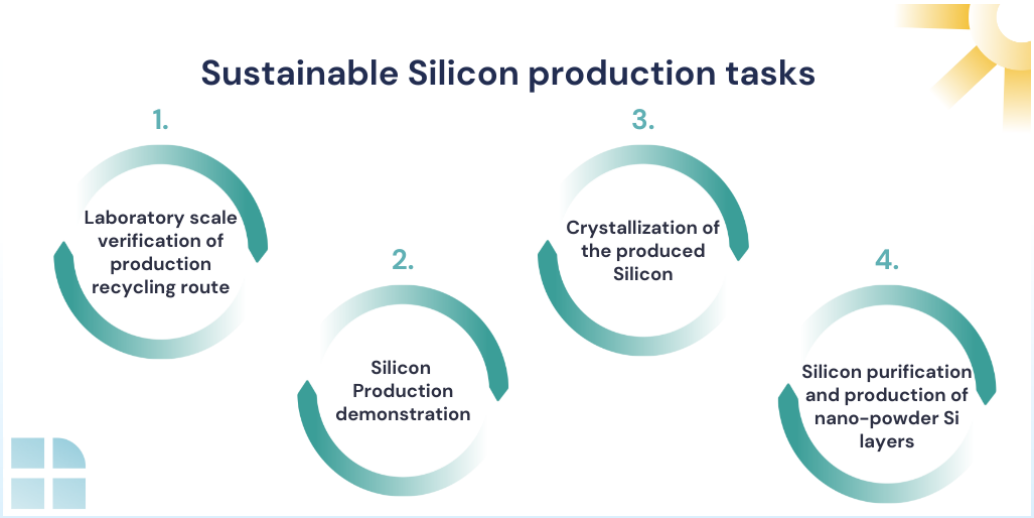
The project's activities will cover the extraction and transformation of raw materials up to the optimisation and recycling of PV modules, but also will create an industrial symbiosis with the battery sector.

Sustainable Silicon production: an innovative process for production of High Purity Silicon through recycling of secondary resources

Silicon (Si) has been defined as a critical raw material (CRM) by the European Union since 2014, due to its high supply risk and economic importance. Si has high economic importance in the EU due to its irreplaceable presence in numerous products on which our society relies on.

The demand for silicon in solar applications has experienced rapid growth during the past decade. At the moment, the production of Silicon and solar panels represents a carbon and energy intensive process, which produces several low-value by-products and wastes. Thus, a shift away from waste generation and carbon emissions towards circularity is necessary for creating a sustainable industry.

In this regard, RESiLEX aims to address these sustainability challenges by demonstrating different industry-driven technological solutions covering the full silicon value chain.
The image below shows the main steps for meeting a sustainable silicon production:



In order to reach this goal, NTNU will work on demonstrating a circular process to produce high purity silicon through aluminothermic reduction of quartz fines, followed by refining of the produced metal utilizing kerf, originating from the cutting wire during wafering of Silicon and representing a loss of more than 40 % of silicon during the process.
Another innovation of this demonstration is the reuse of silicon waste from end-of -life PV modules.

NTNU is optimizing the refining process in laboratory scale and demonstrating it at 100 kg scale. The produced high purity silicon will be used to grow mono-crystalline ingots at CEA that will be used later to produce new eco-designed solar panels in Work Package 4.

This revalorized silicon waste will be transformed into crystalline carbon coated silicon nanoparticles by Nanopow to be tested in lithium-ion battery applications in Work Package 6.
The long-term goal is to assess and implement a circular process for large-scale production of high-purity silicon with low environmental footprint.

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