Name of the knowhow: Recovery of materials from waste silicon solar photovoltaic modules

Summary: Solar photovoltaic (PV) technology is playing important role in clean energy transition. There is phenomenal rise in deployments of PV modules from just 5 GW in year 2005 to cumulative capacity of over 1000 GW globally at the end of year 2022. India is also committed to generate clean energy mainly through solar PV and over 67 GW PV modules already installed by April 2023, which further increase to 280 GW by the year 2030 as target set by the government. However, with rapid deployments arises, the issue of waste management of the PV modules need to be addressed suitably as their end-of-life is usually of 20-25 years. Thus, it is important to develop safe disposal process through efficient & environmental friendly manner for recovery of materials from PV waste.

Extraction of various materials such as glass, silicon, Al, Ag, Cu etc. from waste silicon solar modules involving mechanical, chemical & thermal processes have been carried out at CSIR-NPL. An overall recovery rate of about 85% is achieved with developed process. The recovered materials were characterized using various techniques and analysed to assess its quality. It was found that these materials can be re-used after adequate purification in solar PV, metal-alloy etc. based industries.

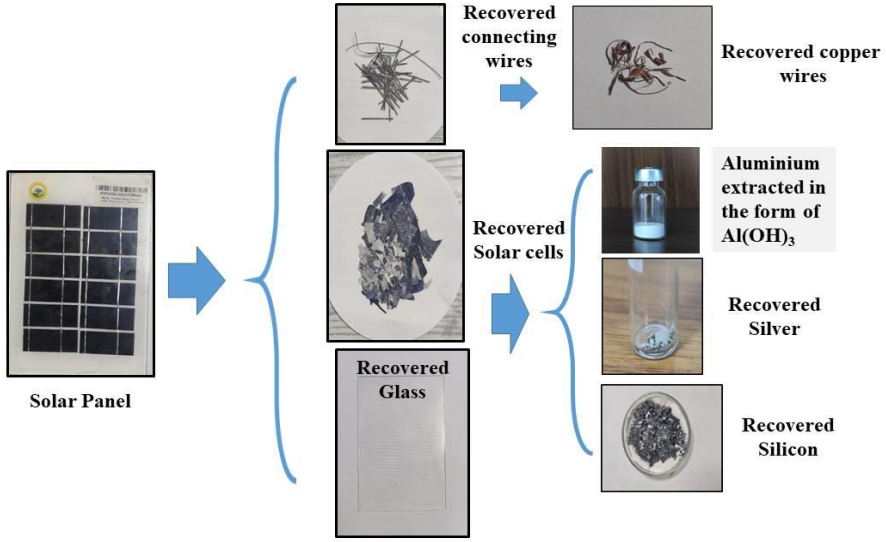

Fig : Extraction of various materials from small size waste silicon PV module

Applications: The recovered materials may find applications in PV, metal-alloy etc. based industries.

Novelty features of this knowhow: Recovery of various materials from waste solar PV modules at ~85% recovery rate (Small size modules).

Advantages of the knowhow: Safe handling and upcycling of materials extracted from waste silicon PV panels, creating a sustainable PV industry by reducing waste, environmental damage, and costs while promoting clean energy adoption.

Choose the Readiness level of the Technology:

Idea	Concept Definition	Proof of concept	Prototype	Lab Validation	Technology Development	Technology Demonstration	Technology Integrated	Market Launch

IPR related details: None

Year of Introduction of the knowhow: May, 2023

Broad Area/Category: Energy (Solar Photovoltiac, Recycling e-waste)

User Industries: Solar PV, Metal-Alloy, Metallurgical grade silicon based industries etc.