

Integrated PV-Recycling – More Efficient, More Effective



PV recycling is a steeplechase



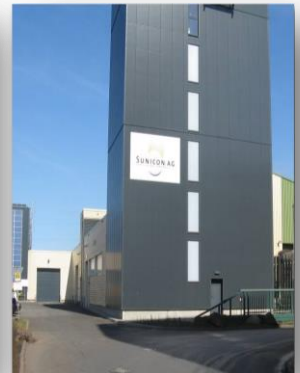
- founded 2004
- 3 plants
- 102 employees



Latest News



founded 2016



WATER . CHEMISTRY . ENVIRONMENT .

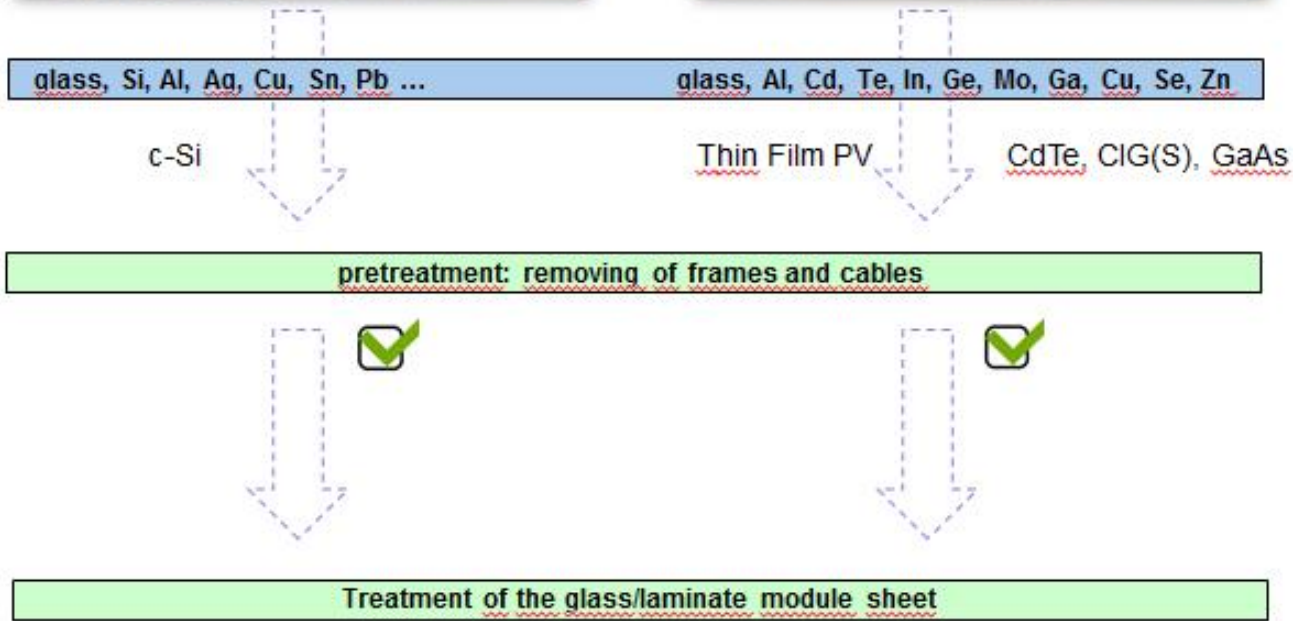


Why we deal with recycling technologies

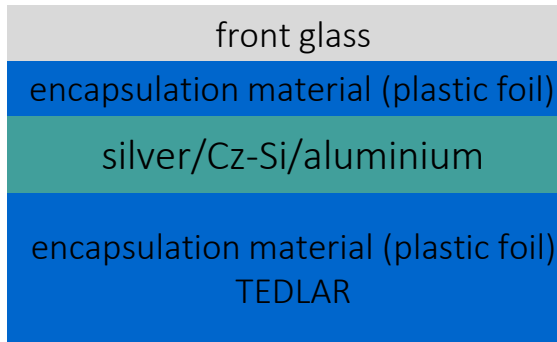
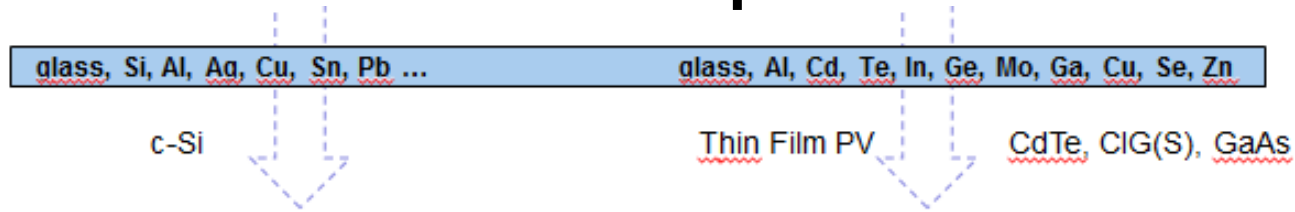
1. Disposal problems have been the subject of specialist conferences in the industry for many years
2. Producers push for solutions (B2B calls)
3. Political constraints (EU directive WEEE)
4. Non-Chinese producers of specialty materials specifically ask for raw materials from recycling
5. Own offers, which contribute to the improvement of the resource efficiency of enterprises, immediately find acceptance on the market

But for many "waste" the technologies are missing ...

The situation in Germany

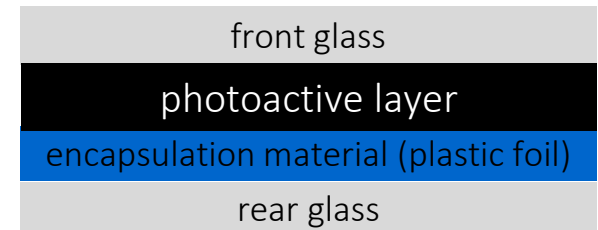


Several types of photovoltaic systems we got from the collection points

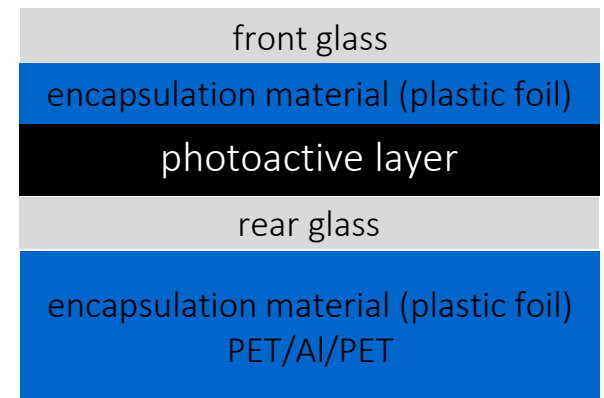


type 3

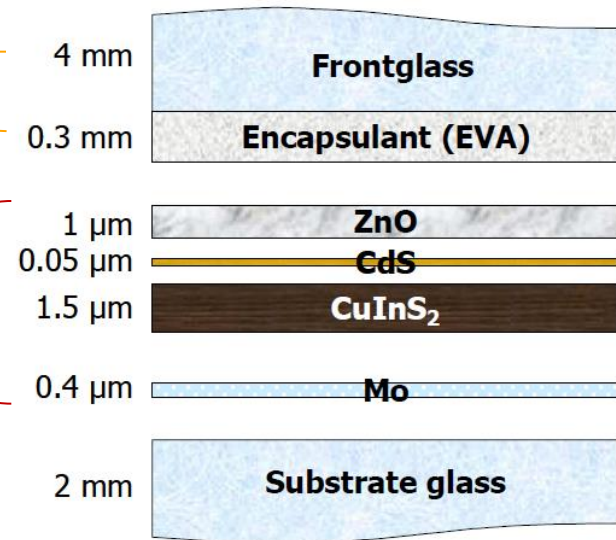
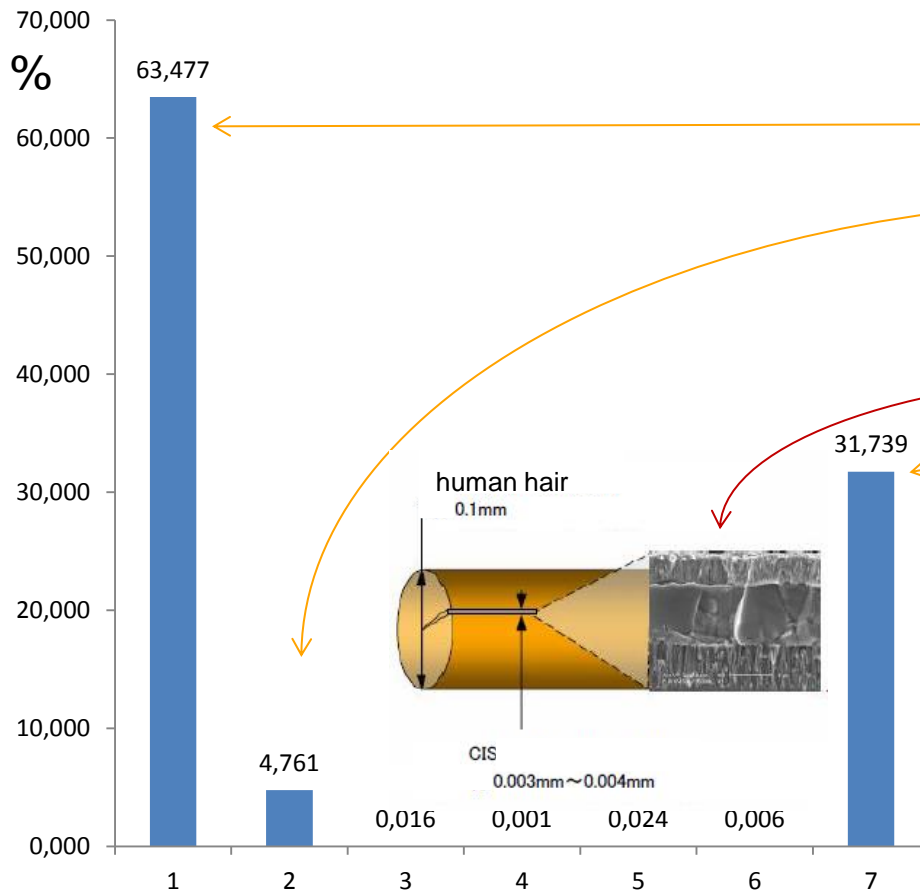
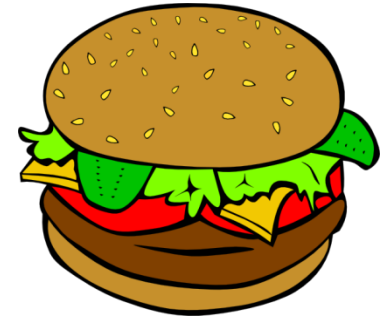
type 1



type 2



➔ Challenge: sandwich structure



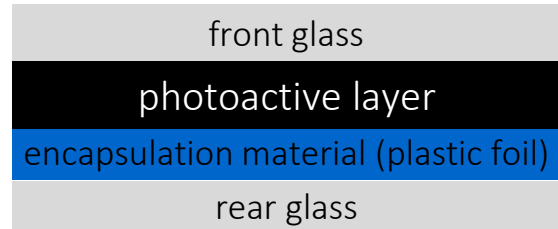
CIS – Type (source: Sulfurcell)

How to treat type 1

Treatment of the glass/laminate module sheet

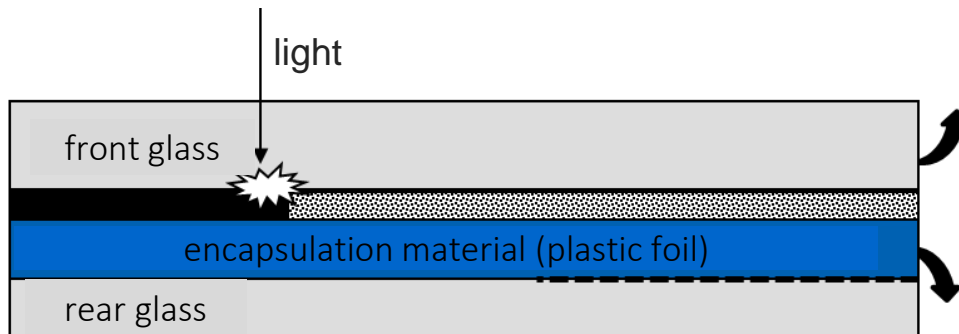
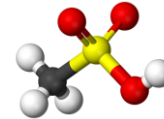


type 1



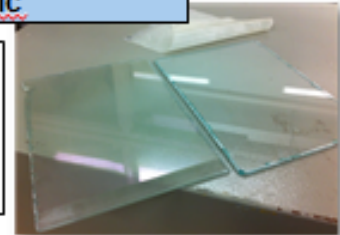
open throughout

hydrometallurgy



glass, plastic

recycling:
iron free front glass,
rear glass and
plastic

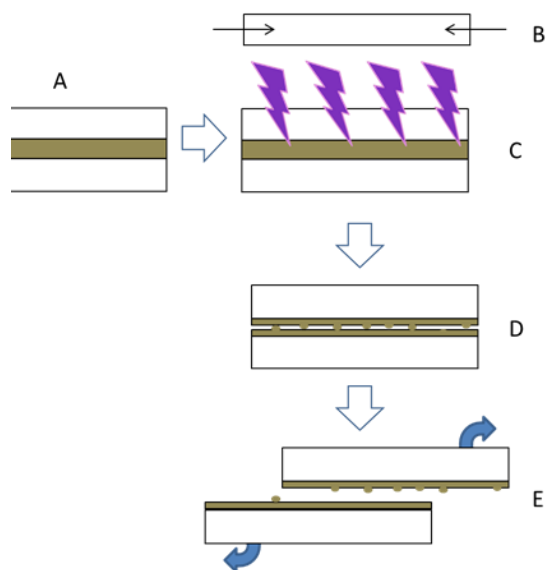
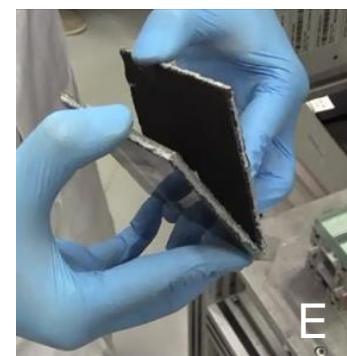
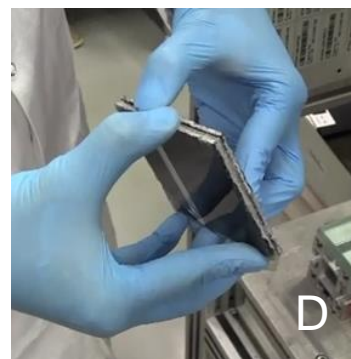
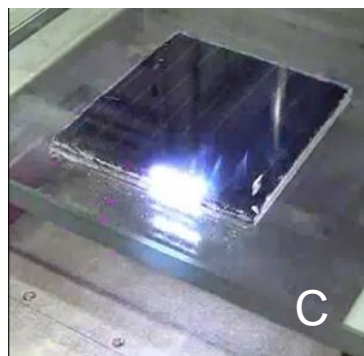
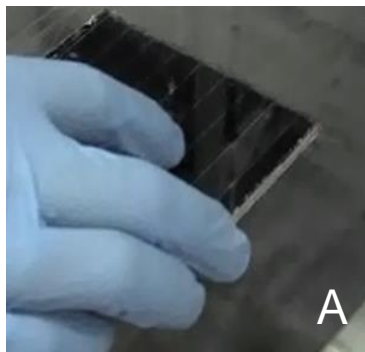


Cd, Te, In, Ge, Mo, Ga, Cu, Se, Zn

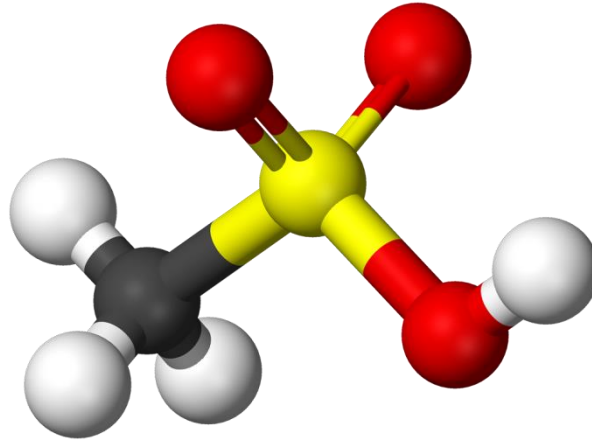
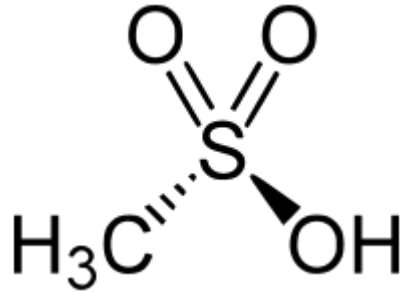
recycling:
polymetallic
solution



How to treat type 1



Methanesulfonic acid (MSA) – our key component for recycling applications

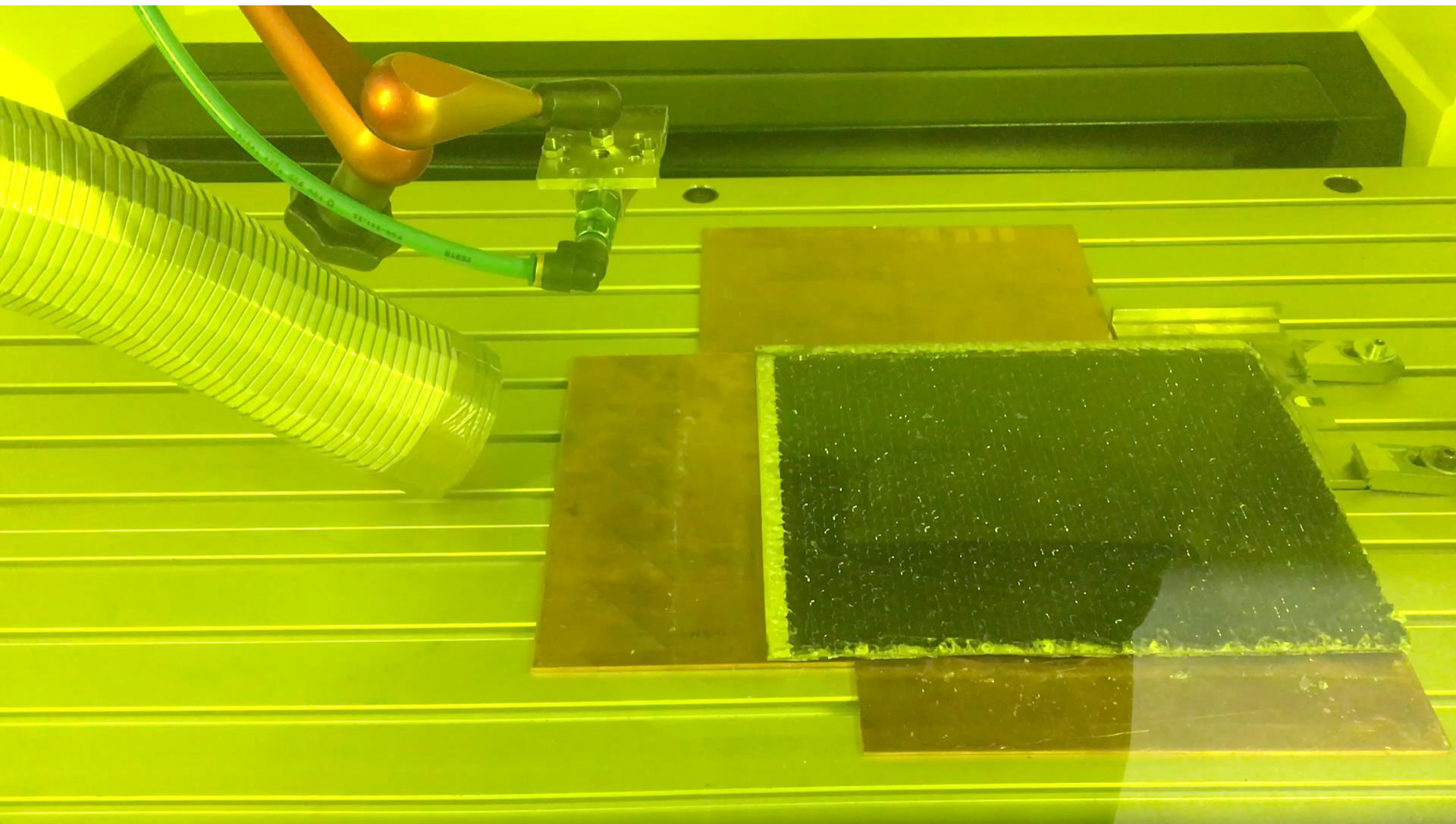


- remarkably high solubility of several metal salts (e.g. table below)
- nonoxidizing
- easy to handle
- high thermal stability
- low vapor pressure
- readily biodegradable

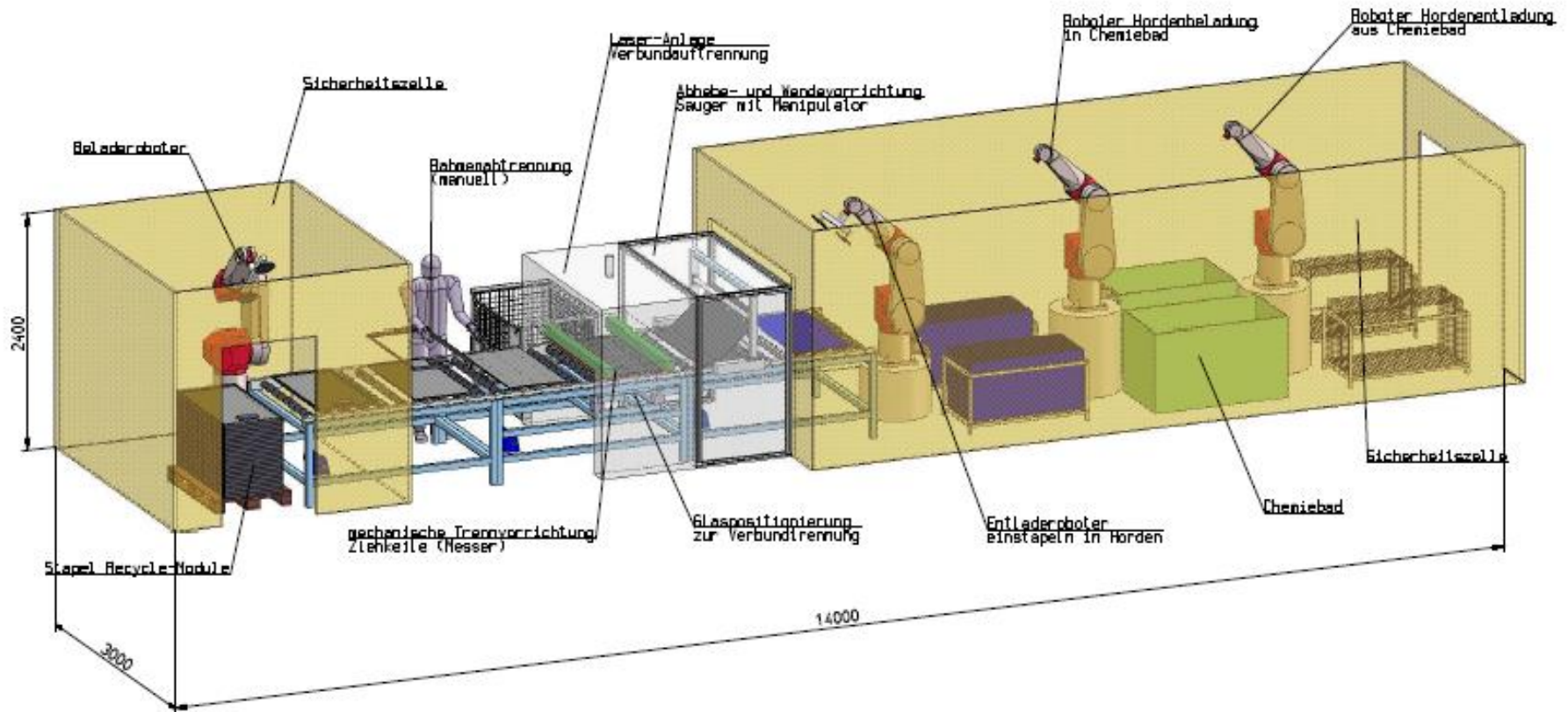
	Methanesulfonate	Chloride	Sulfate
Ag ⁺	713 g/l	0 g/l	9 g/l
Pb ²⁺	1075 g/l	9 g/l	0 g/l

examples for saturation
concentrations at 23°C, water

Experiment in lab scale – laser on broken CIGS (type 1)



A demonstration plant was needed to produce enough feed for the glass manufacturer!



This demonstration plant can treat 10.000 tons of PV waste



greenhouse by using recycled glass slices from our thin film photovoltaic production waste



components/material:

210 kg glass

out of **35 recycled PV slices** (120 x 60 mm)

200 kg aluminium frames

used also for PV mounting

inter laminate clamps 80 mm

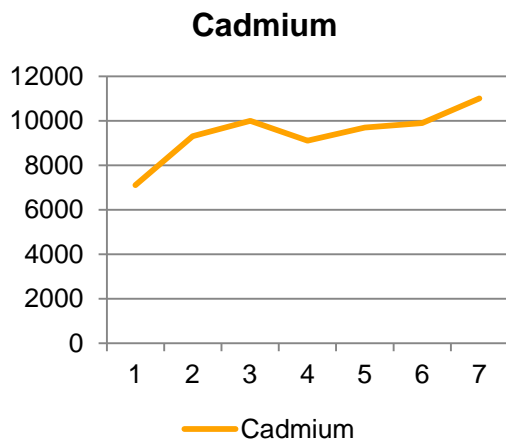
The polymetallic solutions which result from this process are a raw material for further processing by the potential of increasing the concentration of specific industries and they can be supplied.



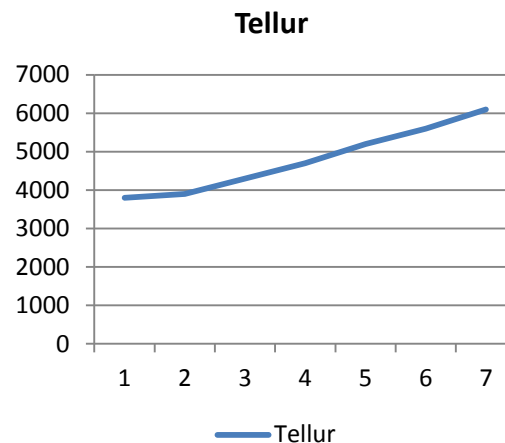
We extracted exemplary indium hydroxide from one of these solutions to produce pure indium.

Results from the thin film demonstration plant using only CdTe TF PV scrap

The graphs show an extract from several campaigns with 3000l 35% Methyenesulfonic Acid and small amount H_2O_2



=> 11,7 kg Cd



=> 6,9 kg Te

(7 campaigns of 300 single glass panels => 2100 panels)

Thank you !

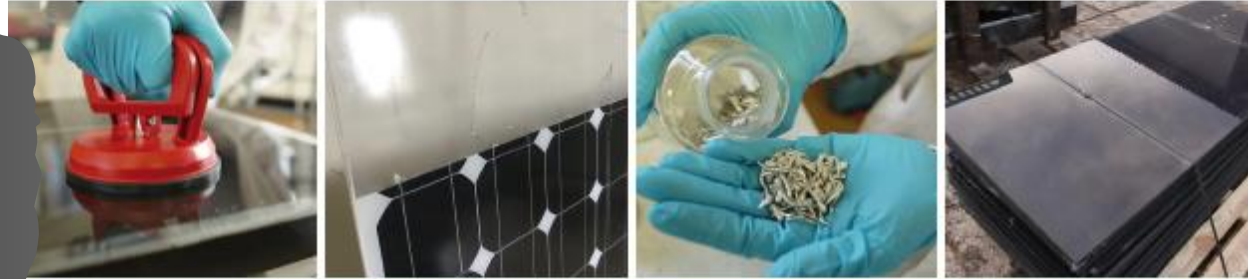


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- Greening the Solar Industry with PV-Recycling
- Certified waste management company
- Proven history of successful waste management solutions in Germany for the solar industry
- Sustainable recycling