

c-Si recycling process

The PV modules are introduced to the thermal treatment system by an automated loading system. During the thermal treatment, decomposition of the organic matrix which serves to bind the solar cells, the front-side glass panels and the copper strings as well as the backside plastic takes place. This treatment is followed by a mechanical separation of the aluminium frame segments and the copper strings from the mixed fraction. Due to their dimensions, these components can be removed completely. In the next step, a physical treatment allows the fraction containing material other than glass and solar cell fragments to be reduced. After the last amount of foreign material has been removed from the glass / broken cell fraction, a chemical treatment follows.

Due to the robust nature of the process as a whole, PV modules in all possible states of processing and use can be recycled.

The technology allows a high degree of purity to be achieved. 94.3 % of the glass fraction has a purity of 99.99975 %. The remaining 5.7 % of the glass fraction is lost in the mixed material fraction. The total mass of complete cell fraction amounts 3 - 4 % of the input module mass. 73 % of the cell fraction can be recycled. 59 % of this amount can be obtained in a purity of 99.9999 %; the other 41 % in a purity of 99.995 %. The cell fraction, which cannot be recycled, is 27 %.

The sum of the finest fraction and the amount of foreign matter removed is 4.3 %. Thus, 95.7 % of a PV module can be recycled by the process described above.

The current manual separation allows the same degree of purity if the modules are more or less intact. The current and future diversity of PV modules to be recycled makes a cost efficient manual separation unfeasible. The process described herein is scaled for several thousand metric tons per year and can be used to recycle intact as well as heavily damaged modules.

