Recycling of Compound Semiconductor Photovoltaics by Means of Ambipolar Electrolysis
Technology #14319

Applications

The toxicity and scarcity of cadmium telluride (CdTe) have raised concerns over the use of CdTe in commercial products and have spurred a push towards finding a method to recycle those materials. This invention would be particularly useful in the photovoltaic industry where CdTe is a widely used solar material and for recycling companies focusing on compound semiconductors.

Problem Addressed

The issues with the current technology are the toxic environmental impact of Cd and Te, which are widely used in solar cells, and the multiple steps required in the present recycling methods. The concern of Cd and Te toxicity pressures manufacturers to recycle spent solar cells and manufacturing waste. The proposed AE recycling of CdTe solar cells selectively dissolves the compound semiconductor for the reclamation of Cd and Te that are suitable for reentry into the CdTe manufacturing stream.

Technology

The invention provides a new method to recycle compound semiconductor materials used in the photovoltaic industry by employing ambipolar electrolysis (AE). The proposed process selectively dissolves the semiconductor material off the solar cell into a molten salt bath, leaving behind the glass and metal wire contacts. AE can then be performed on the molten salt containing the dissolved compound, resulting in the simultaneous electrodeposition of the two metals onto separate electrodes. To recycle CdTe, the molten salt can be CdI₂ or CdCl₂-KCl, and the operating temperature is 500°C. Given the high purity of the collected molten metals, Cd and Te products could be remixed under N₂, producing CdTe, ready to be reintroduced into the manufacturing stream of new solar cells.

Advantages

- Simple one-step process for the reclamation of Cd and Te
- Continuous, closed-stream recycling where the products can be reintroduced into the manufacturing cycle
- Shortens the recycling process
- Recovers toxic materials

Categories For This Invention:

- Electronics & Circuits
- Semiconductors & Integrated Circuits
- Semiconductor Manufacturing
**Intellectual Property:**

Electrolytic recycling of compounds
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**Publications:**

*Recycling ZnTe, CdTe, and Other Compound Semiconductors by Ambipolar Electrolysis*
Journal of the American Chemical Society. 133, no. 49  
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**External Links:**

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**Image Gallery:**