

The mission

According to IBM estimates, around three million wafers are rejected every year in the semiconductor industry. The valuable silicon of the rejected wafers is disposed of as special waste at huge cost, or smelted for recycling purposes, which requires an enormous amount of energy. IBM has successfully developed a process that enables the recycling of reject wafer scrap.

IBM and other companies in this segment use silicon wafers not only as a substrate for the manufacture of microelectronic products, such as mobile phones computers and home entertainment systems, but also for monitoring the numerous processing phases of the production process. According to semiconductor industry figures, around 250,000 wafers are used throughout the segment every day. IBM estimates that up to 3.3 per cent of these wafers are rejects requiring cost- or energy-intensive disposal or recycling.

In contrast, the silicon wafers consist of a highly valuable raw material that is in particular demand by the solar energy industry for the production of solar cells. 'The silicon shortage is one of the greatest challenges the solar energy industry faces and threatens its rapid growth,' says Charles Bai, Chief Financial Officer at ReneSola, one of the fastest growing solar energy concerns in China. The scarcity of this raw material has led to an immense increase in the price of silicon that favours long-established enterprises with long-term contracts and hinders new providers and the development of new and innovative technologies.

Against this background, the process developed by IBM for the recycling of rejected wafers is a real milestone on the road to reducing energy consumption and costs – in both financial and environmental terms.

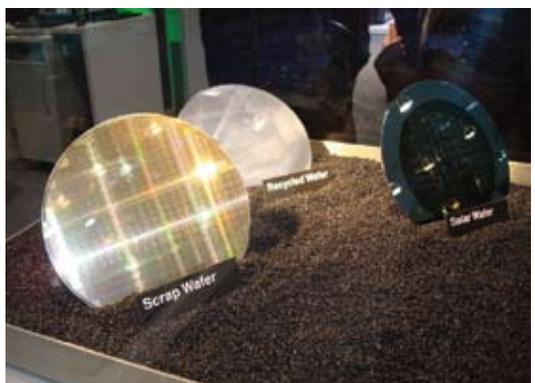
The solution

From wafer scrap to high-performance solar cells.

The innovative recycling process for semiconductor wafers was developed at the IBM manufacturing facility in Burlington (USA). The first step of the process involves a special procedure for the removal of surface structures that allows the further use of the already coated semiconductor wafers. In the next step, solar cells can be applied to the cleaned wafers on the same semiconductor production line, which in turn optimises line capacities. In addition to the costs saved for elaborate disposal or resmelting, the energy savings for silicon processing are a particularly important factor: in comparison with new silicon, and depending on the intended use, it is possible to save between 30 and 90 per cent of the energy required.

The benefits

- Immense energy savings in silicon processing
- No scrapping costs
- Containment of rising prices for solar energy
- Satisfaction of the demand for silicon in the solar energy segment
- Reduction of CO2 emissions
- Variable applications
- Low environmental impact
- Optimised capacities on semiconductor production lines



The demonstration showcase

At IBM Forum Centers, a presentation allows you to experience the individual steps a wafer takes from its original processed form to becoming a solar cell. You will be given information on the recycling process and enjoy a live view of the wafers during the various processing phases. In the exhibit, a light source shining on a solar cell provides a miniature railway set with enough power to run. The train stops immediately as soon as the light is turned off. This is environmental protection so close, you can touch it.



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From scrap
to solar power

