What are the specifications of photovoltaic module solder

Overview

Lead-free solder alloys for PV modules: Life cycle assessment for. Within this study, the focus is on a comparison of solar cell interconnection material.

Key Takeaways

Photovoltaic module solder typically consists of tin-lead (Sn-Pb) or tin-silver-lead (Sn-Ag-Pb) alloys, designed for high thermal reliability and electrical conductivity in PV ribbon joints.Common Solder Alloys
• 60Sn40Pb (SP): A traditional tin-lead solder widely used in PV ribbon joints, offering good wetting and electrical conductivity.

• 62Sn2Ag36Pb (SAP): A tin-silver-lead solder that improves thermal fatigue resistance and mechanical strength due to the addition of silver, which enhances the microstructure stability under thermal cycling .
Thermal and Mechanical Properties
• Melting Temperature: Typically around 183–190°C for 60Sn40Pb and slightly higher for 62Sn2Ag36Pb due to silver content.

• Thermal Shock Resistance: PV module solder must withstand repeated temperature cycles, commonly tested between −40°C to +105°C, simulating environmental conditions .

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• Mechanical Reliability: Solder joints must maintain adhesion to metal fingers and PV cells, resisting cracks and delamination that can lead to hotspots or power loss .
PV Module Solder Joint Design
• Ribbon Size: Standard PV ribbons are approximately 0.25 mm thick and 1.5 mm wide.

• Soldering Process: Ribboned cells are soldered at around 350°C, followed by lamination under vacuum and heat curing to ensure strong electrical and mechanical connections .

• Quality Control: Non-invasive methods like eddy current testing and electroluminescence imaging are used to detect cold solder joints, cracks, or conductivity degradation .
Performance Considerations
• Environmental Durability: Solder must resist thermal cycling, humidity, and UV exposure over the module's lifetime.

• Electrical Conductivity: High conductivity is essential to minimize resistive losses in the PV module.

• Degradation Monitoring: Broken metal fingers and solder microstructure changes are analyzed to predict module longevity and efficiency loss . In summary, PV module solder specifications focus on alloy composition, thermal and mechanical reliability, and long-term electrical performance, with 60Sn40Pb and 62Sn2Ag36Pb being the most common alloys used in crystalline silicon PV modules .

Article Content

PEEL TESTING OF RIBBONS ON SOLAR CELLS AT

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