



Application report Spectroscopic inline-monitoring of wet chemical processes

Branch: Manufacturing of solar cells

Product group: Fibre-optical probes

Situation

During the conversion of a silicon wafer to a finished solar cell, the wafer goes through several wet chemical processes. There are several corrosive texturing and purification baths that contain harsh substances like hydrofluoric acid, nitric acid, fluorosilicic acid, hydrochloric acid, hydrogen peroxide, potassium hydroxide, and sodium hydroxide. To maintain the quality of solar-cell manufacturing, the respective baths have to be kept stable. This requires continuous monitoring for the necessary regulation.

Solution

UV/NIR spectroscopy has measuring times of less than one second offering real-time, inline analysis, which is a distinct advantage over common analysis methods of ion chromatography and titration with measuring times of 6-10 minutes. By combining the acid-proof, alkali-resistant NIR immersion probe with a spectrophotometer and a multi-linear calibration model, the individual ingredients of a chemical bath can be identified. Initially, the spectrophotometer records the characteristic spectrum of different concentrations of the various chemicals via the probe that is immersed in the bath. Using software and multi-linear regression methods, a calibration model is created from the different spectral data. Afterwards, the computed model can be used during the inline measurement to calculate the composition of the bath immediately after the spectra are recorded. Since a calibration model can contain several parameters, the concentration of all chemicals can be measured simultaneously in the bath without personal contact with the harmful substances.



Acid-proof and alkali-resistant NIR immersion probe

Advantages:

- // Stable bath control for a consistent high quality
- // Long service life due to optimised processes
- // Capable of simultaneous monitoring of several baths
- // Reducing of reject costs
- // Increased product quality
- // Real-time, inline monitoring
- // Nearly maintenance-free

Fields of Application:

Alkaline and acidic texturing baths	hydrofluoric acid nitric acid fluorosilicic acid sulphuric acid
Rinsing	Alkalinity / acidity
Hydrophilization	Hydrogen peroxide

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