

Analysis for the development and manufacture of solar cells



- Electrochemical characterization of solar cells
- Monitoring of electroplating processes by voltammetry, titration and ion chromatography

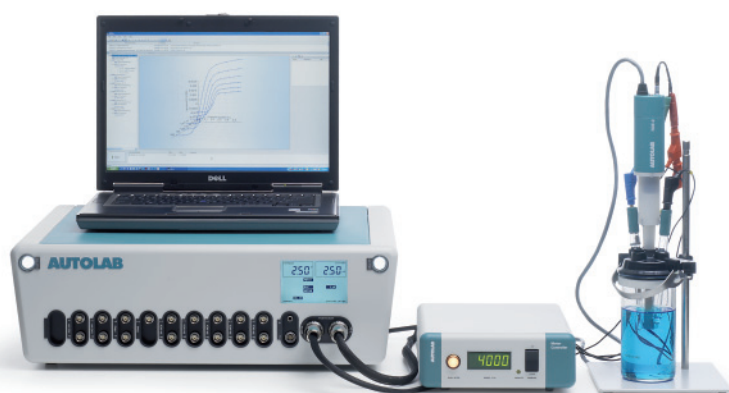
Customized analysis for development and production of solar cells

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The market for solar cells is booming. However, international competition is tough. Opportunities are available for systems with a high degree of efficiency and the possibility for cost reduction in the manufacturing process. Thinner wafers and the development of thin-layer technologies satisfy the demand for a considerably reduced input of materials.

In the manufacturing process, wet chemical processes play a crucial role. The chemicals used in the process baths are consumed continuously, while the concentration of reaction products in the process solution increases. This requires continuous monitoring, which in turn depends on the right analytical instrumentation.

Metrohm is the industry's preferred choice for high-quality laboratory and process analyzers, applications know-how and a first-class, on-the-spot service.



Electrochemical and photoelectrochemical characterization of solar cells

Potentiostats/galvanostats from Metrohm Autolab enable straightforward analysis of the electrochemical and photoelectrochemical processes in dye-sensitized solar cells and organic solar cells. Both static and dynamic photoelectrochemical tests (e.g. IMPS/IMVS) can be performed using the integral light source (LED) and control unit.

The solar cell characteristics are evaluated and calculated automatically by the NOVA software. For this, the standard methods can be selected, modified or freely programmed depending on the task.

- Easy operation using ready-made methods: IV curve / IMVS / IMPS
- Convenience due to automated evaluations and calculations, e.g.
 - max. power point
 - fill factor
 - electron diffusion coefficient
 - open-circuit voltage and short-circuit current
- Integration into test stands
- LabVIEW compatibility

Voltammetry for developing and electroplating baths

Electroplating methods with a very high material yield are used to form the electric contact and generate CIS and CISG semiconductor materials.

Using Metrohm's 797 VA Computrace, the main constituents of electroplating baths and additives can be analyzed very easily and cost-effectively, e.g.

- Copper
- Indium
- Selenium
- Thiourea
- Cadmium
- Gallium

Multicomponent determination with a single analysis

Ion Chromatography (IC) enables the determination of numerous main and secondary components of electroplating baths as well as traces of impurities, be they organic or inorganic ions or other polar substances, with utmost reliability and precision. A major benefit of ion chromatography is that chemically similar substances can be determined in parallel in a single analysis. The analyte concentrations may be anything between the ng/L to % ranges.

Typical applications

Alkaline and acidic texturizing	HF/HNO ₃ /H ₂ SiF ₆ H ₂ SO ₄ Acetic acid Alkalinity Acidity
Washing and cleaning	pH and conductivity Rinsing additives Complexing agents (NTA, EDTA, ...)
Hydrophilization	H ₂ O ₂ Alkalinity Acidity
Direct measurements	pH and conductivity Parameters from third-party instruments

Titrimetric determination of bath components

Titration is a robust, well established analytical technique in monitoring electroplating processes. Titration combines utmost precision with a very easy procedure. In most cases it is possible to use undiluted sample solution to determine the components of the reaction solution. This enables even semiskilled users to carry out the analysis fast and accurately.



850 Professional IC

The bath content of HF, acetic acid, HNO₃, H₂SO₄ in etching baths is determined using conductivity detection. Si is measured via post-column reaction (PCR) and subsequent UV/VIS detection. The content of H₂SiF₆ is calculated from the concentration of Si.



905 Plate Titrande

A broad range of different analyses can be performed with the 905 Plate Titrande, e.g. determining components of electroplating baths, the composition of the acidic content of etching baths or controlling the purity of rinsing solutions.

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