Surface Passivation of c-Si solar cells

Application
Industrial Surface Passivation of c-Si Solar Cells

Due to the continuous need to reduce production costs and increase conversion efficiency, surface passivation of crystalline silicon (c–Si) solar cells has become essential. Increasing the efficiency through high-quality surface passivation is widely an industry standard today.

Atomic Layer Deposition

Atomic Layer Deposition (ALD) is a gas phase sequential coating method that produces completely conformal and pinhole-free thin films. ALD has entered photovoltaics with a solid offering to improve the efficiency of c–Si cells by surface passivation. Beneq ALD provides an industrially competitive means to achieve the highest quality of surface passivation with aluminum oxide (Al₂O₃).

Surface Passivation in the Manufacturing Process

Surface passivation of c-Si solar cells can be applied both on n- and p-type cells:
- double-side coating in one step (for n-type)
- single-side coating for p-type (wrap around less than 1 mm)

Benefits of using Beneq ALD equipment

- 1+ percentage point increase in efficiency
- completely conformal and pinhole-free
- no plasma damage
- low-temperature processing (150 – 250 °C)
- no atmospheric contamination

High throughput

- up to 2000 wafers/hour [double-side coating, n-type]
- up to 3000 wafers/hour [single-side coating, n- and p-type]

Low cost-of-ownership

- 0.04 €/wafer [double-side coating, n-type]
- 0.02 €/wafer [single-side coating, n- and p-type]

ALD Equipment for Surface Passivation

Beneq equipment for ALD are a combination of expert design, solid hands-on experience and extensive research and development. All equipment is modular and thus adaptable to different surfaces and thin film applications. Thin film coatings produced by Beneq equipment are adjustable, allowing producers to match exactly the passivation properties with the surface structure for maximum cell efficiency.

For the first trials with your cells, let Beneq prove the concept of surface passivation to you with our Coating Services, which offer:

- Al₂O₃ deposition on c-Si wafers with ALD in Class 10,000 clean-room environment
- fast access to large wafer quantities for R&D purposes (1000’s per week)

For R&D and pilot-scale production, the Beneq Thin Film System TFS 500 (above) is the right choice. The robust and reliable TFS 500 offers the easiest entry to ALD-based surface passivation of c-Si solar cells.

For industrial production, Beneq offers the TFS NX300 Thin Film System for ALD.

Beneq — excellence in ALD

Beneq is a pioneer in applying ALD to existing and emerging industrial thin film production. With the world record in substrate size, the first true roll-to-roll system to the market and many other unprecedented industry-scale ALD innovations, we are truly a solid partner and equipment provider for industrial thin film production.
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