VON ARDENNE develops and manufactures industrial equipment for vacuum coatings on materials such as glass, wafers, metal strip and polymer films. These coatings give the surfaces new functional properties and can be between one nanometer and a few micrometers thin, depending on the application.

Our customers use these materials to make high-quality products such as architectural glass, displays for smartphones and touchscreens, solar modules and heat protection window film for automotive glass.

We supply our customers with technologically sophisticated vacuum coating systems, extensive expertise and global service. The key components are developed and manufactured by VON ARDENNE itself.

Systems and components made by VON ARDENNE make a valuable contribution to protecting the environment. They are vital for manufacturing products which help to use less energy or to generate energy from renewable resources.
CONTACT & PROTECTION COATINGS
FOR METAL BIPOLAR PLATES

APPLICATION
VON ARDENNE provides solutions for contact and corrosion protection coatings on metallic bipolar plates for PEM fuel cells. These solutions are based on electron beam evaporation technology and include equipment, key technology components and application technology.

DEPOSITION EQUIPMENT
- High throughput electron beam PVD and sputter coating of steel substrates with carbon, metals and oxides.
- Plasma pretreatment for surface activation and cleaning.
- R&D, pilot and production equipment for the coating of strip material (R2R) and embossed bipolar plates (S2S).

VON ARDENNE COATING STACK FOR BIPOLAR PLATES
Our carbon-based layer systems are optimized for a low ICR (interfacial contact resistance), good adhesion and high corrosion resistance. ICR, corrosion resistance and stack performance of this layer stack are comparable to the gold standard (see technical data).

OUR OFFER
- Assessment of your fuel cell component coating requirements:
  - Discussion of your coating requirements
  - Assessment of manufacturability
  - Adaptation or development of coater concept
  - Cost of ownership calculation
  - Proof of principle tests/sample coating on sheets/sample coating on rolls
- Ready for sampling: R2R (max. width 280 mm), S2S (max. 500 mm x 500 mm)
- Ready to quote: S2S and R2R pilot and production systems

TECHNICAL DATA
Subject to change without notice due to technical improvement.

| SUBSTRATE | Material | stainless steel e.g. SUS316, Ti
| Size | sheets: upon request, rolls: width up to 1200 mm
| Thickness | < 1 mm, e.g. 100 µm

| INTERFACIAL CONTACT RESISTANCE |
| Of our coating stack |
| 2.5 mΩ × cm² (measured incl. 2 × GDL 25 AA at 150 N/cm²) |
| Of gold standard |
| 2.5 mΩ × cm² (measured incl. 2 × GDL 25 AA at 150 N/cm²) |

| CORROSION TEST IN H₂SO₄ SOLUTION |
| +0.1 mΩ × cm² after 100 h at 80 °C |

| CELL TEST |
| No significant performance decay in ZBT AST-3 accelerated stress test |

VACUUM COATING TECHNOLOGY & EQUIPMENT

This diagram shows the current output of a fuel cell (single cell assembly) operated at accelerated stress test conditions according to ZBT’s AST-3 cycle. The test duration of 470 hours corresponds with several thousand hours of operation under standard conditions. The diagram compares the performance of four coating conditions (see diagram).

The performance of the VON ARDENNE coatings – both in pre- and in post-coating – reaches or exceeds the performance of a PVD gold coating. The ~5% performance drop during the test period was found to originate from MEA deterioration, according to analysis of IV-characteristics measured during the test.

The VON ARDENNE coatings are applied after removing the native oxide layer. They reduce the interfacial contact resistance (ICR) of the bipolar plate surface from the range above 50 mΩ×cm² to the level of ~1 mΩ×cm². These values are comparable to those reached by PVD gold coatings.

APPLICATION
Contact & Protection Coating for Metal Bipolar Plates
Vacuum Coating Technology & Equipment

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