

Customer Solutions Lab

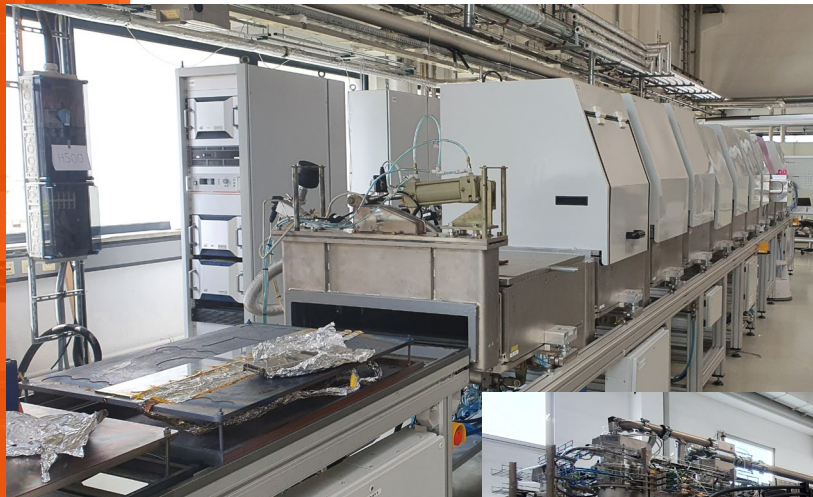
Industrial and Optical Vacuum Coatings

ADVANCED THIN FILM DEPOSITION CAPABILITIES

- ▶ Single and Dual Magnetron Sputtering (SMS and DMS)
 - DC and pulsed DC (up to 150/350 kHz)
 - Bipolar pulsing (up to 150 kHz)
 - NEW: Dynamic Reverse Pulsing (DRP)^{®1}
- ▶ RF sputter deposition and etch
- ▶ Rotary and planar targets (60 cm length)
- ▶ Anode applications

AVAILABLE

- ▶ Product demonstrations
- ▶ Gen 2.0 in-line coater and industrial drum coater
- ▶ Designing and performing film coating R&D projects, material characterization/analytical laboratory
- ▶ Hands-on experience with AE products on deposition tools



Lab Capabilities

INSTRUMENTATION

GEN 2.0 IN-LINE FLAT PANEL COATER

- Substrate size up to 500 X 600 mm²
- Planar and rotary cathodes
- Dual Magnetron Sputtering (DMS)
- Standard, sine wave, bipolar, and DRP with addition of anode
- RF plasma etch for in situ pre-cleaning

INDUSTRIAL/OPTICAL DRUM COATER

- Substrate size up to 200 X 400 mm²
- Rotary cathodes
- Standard, bipolar pulsing, DC, pulsed DC, dual DC, and DRP
- Substrate biasing RF, DC, and pulsed DC

JUMBO GLASS DEMO COATER (SATELLITE LAB LOCATION IN GERMANY)

- Substrate size up to 3.4 X 1.0 m²
- Rotary cathodes
- DMS, single magnetron
- Standard, bipolar pulsing, and DRP
- DC, Pulsed DC (up to 150 kHz)

IN-STOCK TARGET MATERIALS AND GASES³

- | | |
|--------------------------|--------------------------------------|
| ▶ Planar targets | ▶ Rotatable targets |
| ▪ Aluminum (Al) | ▪ Aluminum (Al) |
| ▪ Chromium (Cr) | ▪ Silicon (Si) |
| ▪ Copper (Cu) | ▪ Titanium Oxide (TiO _x) |
| ▪ Indium Tin Oxide (ITO) | ▶ Gases |
| ▪ Titanium (Ti) | ▪ Argon (Ar) |
| | ▪ Oxygen (O ₂) |
| | ▪ Nitrogen (N ₂) |

METROLOGY/CHARACTERIZATION POSSIBILITIES

- ▶ Ellipsometry (thickness, refractive index)
- ▶ UV-Vis spectroscopy (transmission/absorbance)
- ▶ Electrical resistivity
- ▶ Residual stress
- ▶ In situ optical emission spectroscopy during deposition
- ▶ Current and voltage probes, oscilloscope
- ▶ In situ temperature (micro thermocouples and optical pyrometer)
- ▶ Surface roughness (AFM); Micro-hardness (indentation)
- ▶ Secondary Ion Mass Spectrometry (SIMS), Electron Probe Micro Analysis (EPMA)
- ▶ X-ray analysis, including XRR, XPS/ESCA, XRD
- ▶ And more!

Innovations Park Karlstein (40 mins from Frankfurt Airport)



¹ DRP has significantly enhanced dynamic deposition rate (DDR)

² Various small coupon materials (e.g., glass, sapphire, silicon and more) can be used via carrier

³ Inquire regarding availability / lead time for sourcing other target materials and gases

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