HIGH-RATE DEPOSITION OF PURE SILICON LAYERS

Silicon is of interest for many different applications due to its electronic properties as well as due to the diverse effects that result from its being chemically inert.

Silicon layers with suitable thickness as well as sufficient purity are necessary for many applications. A very economic way has been found to meet these requirements based on previous development work at Fraunhofer FEP. High-rate deposition of silicon layers by means of electron beam evaporation is not only attractive from an economic point of view, but also because of the high level of purity that can be achieved by this method at the same time.

Application examples

- **Si coating**
  - high-purity
  - high-rate
  - heat resistance
  - large surfaces

- **Semiconductor technology**
  - barrier coatings for susceptors
  - functional layers for devices
  - silicon-on-insulator

- **Photovoltaics**
  - PV absorber layers

- **Ionizing radiation**
  - protective coatings for X-ray and sensor windows and seals

- **Battery technology**
  - high-porosity anode materials

- **Aerospace technology**
  - protective coatings, hermetic sealing
  - thermal insulation
  - shielding against external influences

- **Microsystems engineering**
  - sensors, actuators, oscillators

- **Vacuum engineering**
  - surface refinement
  - corrosion protection
What we provide

- feasibility studies
- technology development
  - determining optimal process parameters
- integration of pre- and post-processing is available
- pilot experiments
- analytical capabilities for processes and products at all stages
- comprehensive customer support right through to realisation of facilities
  - design and construction of specific system components
  - adaptation and installation into new or existing production facilities
  - technical maintenance of facilities
  - long-term collaboration for development of new or existing products, or exchange of facility components

We focus on quality and the ISO 9001.

Substrates

- graphite components and films
- stainless steel and other metals
- crystalline substrates (silicon and sapphire wafers)
- glass
- ceramic
- piezoelectric materials

Properties

- high deposition rates (> 300 nm/s) [see Fig. 4]
- coating of large areas (coating widths > 300 mm) [see Fig. 5]
- layer thickness > 180 μm
- low risk of external contaminant ingress
- high purity of layers with sufficient low metallic contamination (Fe: < 5 × 10^{14} cm^{-3}, Cu: < 3 × 10^{14} cm^{-3}) [see Fig. 6]
- low processing temperatures feasible (< 300°C)
- hydrogen-free layers
- dense or porous layers (depending on requirements)
- amorphous, microcrystalline, and polycrystalline structure (depending on requirements)