

New technology: Coating with silicon carbide alloys

Coatings

PSC Technologies can selectively apply coatings of silicon carbide (SiC) alloys on a wide variety of materials:

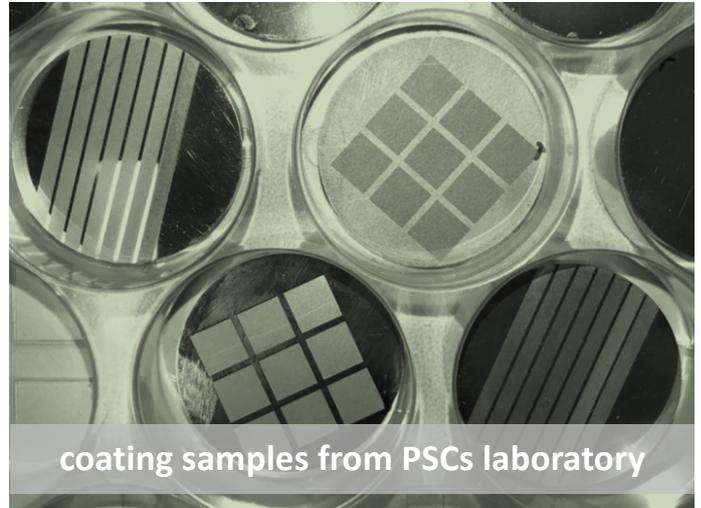
- Steel
- Aluminium
- Copper
- Silicon
- Glass
- Ceramics

Silicon carbide coatings have outstanding features for a wide range of applications:

- high abrasion resistance
- nearly as hard as diamond
- good tribological characteristics
- high heat conductivity
- heat resistance up to 2000°C
- extremely corrosion resistant
- customisable mechanical properties with upcoming wide variety of alloys
- Electrical insulator or conductor dependant on doping (SiC is a semiconductor)
- no problematic raw materials

Structured coatings from 5µm upwards

- minimum thickness 5µm (for the time being)
- polycrystalline 3C SiC, grain size up to several mm, depends on substrate and alloy
- flexibility, rapid manufacturing, small lot sizes



Wide range of applications:

- wear parts, gliders
- corrosion protection
- microelectronics
- electrical insulation, heat transfer
- optical technologies
- micromechanics
- sensors

PSC Technologies offers

- development of appropriate coatings
- custom-specific materials
- development of special coaters



Breakthrough in the use of silicon carbide (SiC): 3D printing of configurable silicon carbide alloys

Most interesting for:

- tools
- heat management
- mechanical parts
- seals, nozzles, filters

Unique features of silicon carbide:

- extremely hard and abrasion-resistant
- high mechanical load capacity
- extremely corrosion and heat resistant
- nearly no thermal expansion
- heat transfer better than aluminium
- electric insulator

Advantages of 3D printing

- arbitrary complex shapes improve function
- optimised geometries save material
- silicon carbide allows functional integration: support structures / casing / heat exchanger...

A new kind of material – no sintering

Until now nobody can produce such a dense silicon carbide material. Various SiC-based sintered materials are being offered by ceramics manufacturers. SiC powder, often with the help of binders is sintered into simple shapes by applying high pressures and temperatures.

PSC goes a new way

Its multi-crystalline structure is directly formed in the 3D printer: Material synthesis and final shaping occur in one step.

The key: a proprietary precursor material

Silicon carbide does not melt. It evaporates above 2700°C and is extremely heat resistant. That's why it's so hard to process: no casting, no alloys by adding other substances in a molten state. It cannot be 3D-printed like metal where a laser beam melts metal powder.

PSC Technologies, based on decade-long research of Prof. Greulich-Weber, has developed a proprietary precursor material that can be evaporated by a laser beam and immediately crystallises on a substrate. This allows 3D-printing of massive multi-crystalline objects layer by layer.

A wide range of properties with alloys

Mixing additives into the precursor formula allows for printing SiC alloys: a largely unexplored landscape of new and fascinating materials with a huge range of mechanical and electrical properties. In its pure form SiC is an electric insulator but an excellent heat conductor – a rare combination.

Based on developments with commercial powder-bed printers, PSC is developing a new SiC printer: high speed, high quality, moderate cost. Cheaper than printing aluminium.

