Claims

1. A method of producing coated substrates in which method
   a) at least one region of a surface of a porous substrate is provided with at least one surface sealing layer;
   b) at least one aqueous suspension is applied to the at least one surface sealing layer, with the at least one aqueous suspension comprising at least one refractory metal carbide and water; and
   c) the substrate is subjected to a sintering process after step b)

   wherein the porous substrate comprises or consists of a material that is selected from the group consisting of graphite, C/SiC fiber composite materials, SiC/SiC fiber composite materials, carbidic ceramics, nitridic ceramics, oxidic ceramics, and mixtures thereof, and

   wherein the at least one surface sealing layer is selected from the group consisting of pyrolytic carbon layers, silicon layers, zirconium boride layers, tantalum nitride layers, silicon carbide layers, silicon nitride layers, and combinations thereof.

2. A method in accordance with the preceding claim, characterized in that
   - the porous substrate comprises or consists of iso-graphite; and/or
   - the at least one refractory metal carbide is selected from the group consisting of titanium carbides, zirconium carbides, hafnium carbides, vanadium carbides, niobium carbides, tantalum carbides, chromium carbides, molybdenum carbides, tungsten carbides, and mixtures thereof.

3. A method in accordance with one of the preceding claims, characterized in that the at least one refractory metal carbide is present in the at least one aqueous suspension in particle form, with the mean particle size (d50 value) of the particles of the at least one refractory metal carbide being in the range from 0.2 µm to 2 µm, preferably from 0.5 µm to 1.5 µm.

4. A method in accordance with one of the preceding claims, characterized in that the porous substrate is provided with at least one surface sealing layer in step a) by

- impregnating at least a portion of the surface of the porous substrate with at least one polymerizable resin and subsequently carbonizing the resin; and/or
- impregnating at least a portion of the surface of the porous substrate with at least one polysilane and subsequently pyrolyzing the polysilane; and/or
- infiltrating the pores of the porous substrate with silicon and converting the silicon at least partly into silicon carbide; and/or
- at least one layer selected from the group consisting of layers of pyrolytic carbon, silicon carbide layers, silicon nitride layers, and combinations thereof is deposited on the porous substrate by means of CVD; and/or
- at least one layer selected from the group consisting of silicon layers, zirconium boride layers, tantalum nitride layers, and combinations thereof is deposited on the porous substrate by means of a spray process.

5. A method in accordance with one of the preceding claims, characterized in that the at least one aqueous suspension

- comprises 60 to 90 wt%, preferably 70 to 85 wt%, of the at least one refractory metal carbide, relative to the total weight of the aqueous suspension; and/or
- comprises 0.01 to 0.5 wt% of a dispersion agent relative to the total weight of the aqueous suspension, with the dispersion agent preferably being selected from the group consisting of polyvinyl alcohols; polyacrylic acids; polyvinylpyrrolidones; polyalkylene gly-colethers; bases, preferably tetrabutylammonium hydroxide, tetramethylammonium hydroxide, polyethyleneimines, inorganic bases, in particular NaOH, ammonium hydroxide; and mixtures thereof, more preferably selected from the group consisting of ammonium hydroxide, polyalkelene glycolether, and mixtures thereof; and/or

- comprises 0.01 to 5 wt% of a binding agent relative to the total weight of the aqueous suspension, with the binding agent preferably being selected from the group consisting of polyethylene glycol, polyvinyl butyral, polyurethanes, chloroprene rubber, phenolic resins, acrylic resins, carboxymethyl celluloses, alginic acid, dextrins, sodium biphenyl-2-yloxides, polyphenyloxide, and mixtures thereof, more preferably selected from the group consisting of sodium biphenyl-2-yloxides, polyphenyl oxide, and mixtures thereof; and/or
- is manufactured by mixing its components with the aid of a dispersion device, with the mixing preferably taking place with the aid of the dispersion device while using grinding elements and/or over a time period of at least 12 hours.

6. A method in accordance with one of the preceding claims, characterized in that the application of the at least one aqueous suspension takes place by means of dipping, brushing, and/or spray application, preferably by means of spray application, in step b).

7. A method in accordance with one of the preceding claims, characterized in that the sintering process in step c) takes place
   - at a temperature of from 2100°C to 2500°C, preferably from 2200°C to 2400°C, and/or
   - with a holding time of 1 hour to 15 hours, preferably of 2 hours to 10 hours, and/or
   - at a pressure of 0.1 bar to 10 bar, preferably 0.7 bar to 5 bar, and/or
   - under argon atmosphere.

8. A coated substrate comprising a porous substrate, at least one surface sealing layer arranged on at least one region of the surface of the porous substrate, and at least one protective layer that is arranged on the at least one surface sealing layer and that comprises at least one refractory metal carbide,

wherein the porous substrate comprises or consists of a material that is selected from the group consisting of graphite, C/SiC fiber composite materials, SiC/SiC fiber composite materials, carbidic ceramics, nitridic ceramics, oxidic ceramics, and mixtures thereof,

wherein the at least one surface sealing layer is selected from the group consisting of pyrolytic carbon layers, silicon layers, zirconium boride layers, tantalum nitride layers, silicon carbide layers, silicon nitride layers, and combinations thereof, and

wherein the coated substrate can be or is manufactured by a method in accordance with one of the claims 1 to 7.

9. A coated substrate in accordance with claim 8, characterized in that the at least one protective has a mean layer thickness of at least 20 µm, preferably of 20 µm to 150 µm, particularly preferably of 30 µm to 100 µm.

10. A coated substrate in accordance with claim 8 or claim 9, characterized in that the standard deviation of the mean layer thickness of the at least one protective layer is below 6%, preferably in the range of 0.5% to 6% particularly preferably in the range of 1% to 6%,.

11. Use of a coated substrate in accordance with one of the claims 8 to 10 in semiconductor crystal growing, with the coated substrate preferably being a coated crucible.