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(71) Applicant (for all designated States except US):

STRYKER TRAUMA GMBH [DE/DE]; Prof.-
Küntscher-Str. 1-5, 24232 Schönkirchen / Kiel (DE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **SPEITLING, Andreas** [DE/DE]; Oppendorfer Weg 36, 24149 Kiel (DE).

(74) Agent: **MAIWALD PATENTANWALTS GmbH**; Korbinian Kopf, Elisenhof, Elisenstr. 3, 80335 Munich (DE).

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(54) Title: ANTIMICROBIAL PROVISION OF TITANIUM AND TITANIUM ALLOYS WITH SILVER

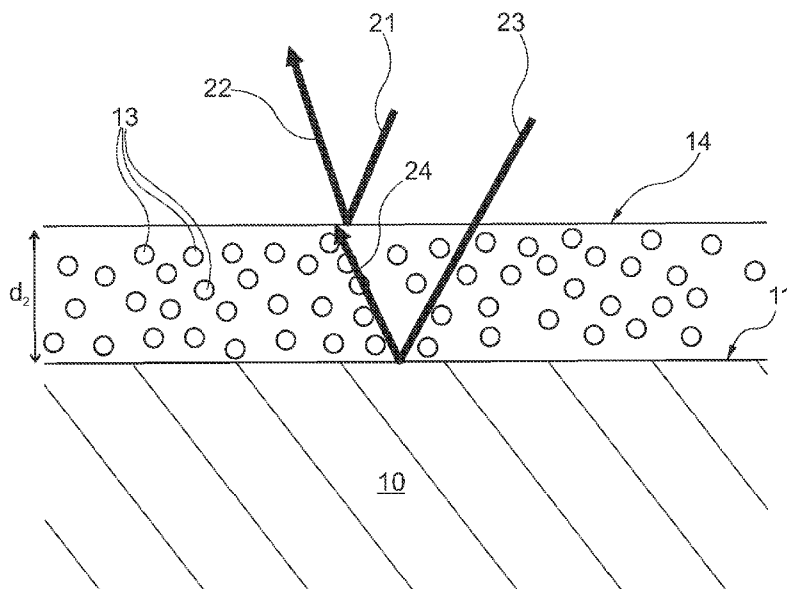


Fig. 1

(57) Abstract: A method for the antimicrobial provision of implant surfaces with silver, in which the method comprises an anodizing of the implant surface with an electrolyte, in which the electrolyte has a silver-yielding substance. Alternatively, the method comprises a silver implantation or a silver PVD deposition.





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AMENDED CLAIMS
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1. A method for the antimicrobial provision of implant surfaces with silver, wherein the implant is made of titanium or titanium alloy, the method comprising the step of:
anodizing of the implant surface in the presence of an electrolyte (S1a, S1b),
wherein the electrolyte comprises a silver-yielding substance (19) and a reducing agent, wherein the silver is reduced at least partially from silver ions by the reducing agent.
2. The method according to Claim 1, in which the silver-yielding substance comprises a silver salt.
3. The method according to Claim 2, in which the silver salt comprises silver nitrate.
4. The method according to Claim 1, in which the reducing agent comprises sodium borohydride.
5. The method according to any of the preceding claims, in which the anodizing comprises an anodizing of Type II (S1a).
6. The method according to any of the preceding claims, in which the anodizing comprises an anodizing of Type III (S1b).

7. The method according to any of the preceding claims, in which on anodizing, a solution is added to the electrolyte which has a concentration of 1×10^{-4} M to 1×10^{-2} M, preferably approximately 1×10^{-3} M silver nitrate and a concentration of 2×10^{-4} M to 2×10^{-2} M, preferably approximately 2×10^{-3} M sodium borohydride.
8. The method according to any of the preceding claims, in which silver ions are reduced and are incorporated before precipitation as nanoparticles into the anodizing layer (d1) of the implant surface (11) or an oxide layer (d2) situated thereon.
9. A method for the antimicrobial provision of implant surfaces with silver, wherein the implant is made of titanium or titanium alloy, the method comprising the steps of:
a silver implantation (S2), and
an anodizing (S1a, S1b) of the implant surface.
10. The method according to Claim 9, in which parameters of a silver implantation are selected so that a penetration depth (d3) of the silver lies between 0.5 and 2 micrometres, in particular at approximately 1 micrometre.
11. A method for the antimicrobial provision of implant surfaces with silver, wherein the implant is made of titanium or titanium alloy, the method comprising the steps of:
a physical gas phase deposition (S3), and
an anodizing (S1a, S1b) of the implant surface (11).
12. The method according to Claim 11, in which the physical gas phase deposition is carried out alternately with silver (19) and with titanium (18).
13. The method according to any of Claims 11 to 12, in which the physical gas phase deposition is carried out simultaneously with silver (19) and with titanium (18).

14. The method according to any of Claims 11 to 13, in which the one covering layer applied by a physical gas phase deposition has a thickness (d4) between 1 and 3 micrometres, in particular 1 micrometre.

15. The method according to any of Claims 9 to 14, in which the anodizing is an anodizing of Type II (S1a) or of Type III (S1b).

16. A computer program which, when it is executed by a processor, is designed to carry out the method according to any of Claims 1 to 15.

17. A computer-readable medium on which the computer program according to Claim 16 is stored.