CLAIMS

1. Method for the surface treatment of a metal material in the powder state, said method comprising the step of obtaining a powder (30) formed from a plurality of particles of the metal material to be treated, and of subjecting said metal powder particles (30) to an ion implantation process by directing a beam (14) of singly-charged or multi-charged ion towards an outer surface of said particles, said ion beam being produced by a source of singly-charged or multi-charged ions, wherein said particles have an overall spherical shape with a radius (R), characterised in that the metal material is a precious metal selected from the group comprising gold and platinum, or in that the metal material is a non-precious metal selected from the group comprising magnesium, titanium and aluminium, and in that the material to be ionised is chosen from the group comprising carbon, nitrogen, oxygen and argon.

2. Method according to claim 1, characterised in that the particles of the metal powder (30) are agitated throughout the duration of the ion implantation process.

3. Method according to claim 1, characterised in that the grain size of the particles of the metal powder (30) used is such that 50% of all of said particles have a diameter that lies in the range 1 to 2 micrometres, whereby the average diameter of the particles of the metal powder (30) does not exceed 50 micrometres.

4. Method according to claim 2, characterised in that the grain size of the particles of the metal powder (30) used is such that 50% of all of said particles have a diameter that lies in the range 1 to 2 micrometres, whereby the average diameter of the particles of the metal powder (30) does not exceed 50 micrometres.

5. Method according to any of claims 1 to 4, characterised in that the ion implantation process is of the ECR electron cyclotron resonance type.

6. Method according to claim 5, characterised in that the singly-charged or multi-charged ions are accelerated under a voltage in the range 15,000 to 35,000 volts.

7. Method according to claim 6, characterised in that the dose of ions implanted lies in the range 1.10^{15} to 1.10^{17} ions.cm^{-2}.

8. Method according to claim 6, characterised in that the ions penetrate the particles forming the metal material powder up to a depth corresponding to 10% of the radius (R) of said particles.

9. Method according to claim 7, characterised in that the ions penetrate the particles forming the metal material powder up to a depth corresponding to 10% of the radius (R) of said particles.

10. Material in the powder state formed from a plurality of particles having a ceramic outer layer (26) and a metal core (24), said particles having an overall spherical shape with a radius (R), the ceramic outer layer (26) corresponding to a carbide or a nitride of the metal of which the core (24) of said particles is made, i.e. a combination of carbon or nitrogen ions with atoms of said metal, the concentration of ceramic material increasing from the outer surface (26) to a given depth beyond which the concentration of ceramic material decreases and becomes zero.

11. Material according to claim 10, characterised in that 50% of the particles have a diameter that lies in the range 1 to 2 micrometres, whereby the diameter of the particles does not exceed 50 micrometres.

12. Material according to any of claims 10 or 11, characterised in that the metal material of which the particles of the metal powder (30) are made is a precious metal selected from the group comprising gold and platinum.

13. Material according to any of claims 10 or 11, characterised in that the metal material of which the particles of the metal powder (30) are made is a non-precious metal selected from the group comprising magnesium, titanium and aluminium.

14. Material according to claim 10, characterized in that the concentration of ceramic material increases from the outer surface to 5% of the length of the radius (R) of the particles, then decreases to 10% of the length of the radius (R) of the particles, and it is zero in the section beyond 10% of the length of the radius (R) of the particles.

15. Material according to claim 11, characterized in that the concentration of ceramic material increases from the outer surface to 5% of the length of the radius (R) of the particles, then decreases to 10% of the length of the radius (R) of the particles, and it is zero in the section beyond 10% of the length of the radius (R) of the particles.

16. Material according to claim 12, characterized in that the concentration of ceramic material increases from the outer surface to 5% of the length of the radius (R) of the particles, then decreases to 10% of the length of the radius (R) of the particles, and it is zero in the section beyond 10% of the length of the radius (R) of the particles.

17. Material according to claim 13, characterized in that the concentration of ceramic material increases from the outer surface to 5% of the length of the radius (R) of the particles, then decreases to 10% of the length of the radius (R) of the particles, and it is zero in the section beyond 10% of the length of the radius (R) of the particles.