CLAIMS

1. A method for producing a medical implant, particularly in the form of a bone screw, a bone nail, a bone pin, a plate, a suture anchor or the like for attaching soft tissues, particularly tendons, muscles and ligaments, to a bone, or in the form of an endoprosthesis or at least a part thereof, from a magnesium alloy having a magnesium content of at least 80% by weight, particularly at least 90% by weight, comprising the following steps:

   a) melting the magnesium alloy to obtain an alloy melt,

   b) atomising the molten alloy in a protective gas atmosphere and at the same time cooling the atomised molten alloy to below the solidification point thereof to obtain an alloy powder,

   c) shaping the alloy powder by compaction to obtain an alloy green body,

   d) extruding the alloy green body to obtain a magnesium alloy moulded article, and

   e) producing the medical implant from the magnesium alloy moulded part.

2. The method according to claim 1, characterized in that in step b) the alloy melt is at a temperature from 750 to 925 °C, particularly from 775 to 850 °C during atomisation.

3. The method according to claim 1 or 2, characterized in that in step b), atomisation may take place under a pressure from 15 to 25 bar, particularly 17 to 23 bar.

4. The method according to any one of the preceding claims, characterized in that the protective gas atmosphere in step b) is an inert gas atmosphere, particularly an argon and / or helium atmosphere.

5. The method according to any one of the preceding claims, characterized in that the alloy powder has an average particle size of 5 to 50 µm, preferably from 10-30 µm, and in particular has a globular shape.

6. The method according to any one of the preceding claims, characterized in that the compaction in step c) is carried out at a pressure of at least 80 bar, in particular at least 100 bar, and preferably in cold isostatic conditions.

7. The method according to claim 6, characterized in that the pressure in step c) is produced by means of a gas atmosphere, in particular an inert gas atmosphere.

8. The method according to any one of the preceding claims, characterized in that in step d) the alloy green is heated to a temperature of 250 to 450 °C, in particular 300 to 400 °C before the extrusion.

9. The method according to any one of the preceding claims, characterized in that in step d) the extrusion is carried out using a punch on a die that is at a temperature of 150 to 400 °C, in particular 200 to 375 °C.

10. The method according to any one of the preceding claims, characterized in that the magnesium alloy consists of from 2.5 to 5% by weight rare earth metals (neodymium mischmetal), 1.5 to 5% by weight yttrium, 0.1 to 2.5% by weight zirconium, 0.01 to 0.8% by weight zinc, the balance being magnesium and

unavoidable impurities as applicable, particularly preferably 5 to 9% by weight rare earth metals (neodymium mischmetal) including yttrium, from 0.1 to 0.8% by weight zirconium, 0.01 to 0.25% by weight zinc, the balance being magnesium and unavoidable impurities as applicable.

11. The method according to any one of the preceding claims, characterized in that the magnesium alloy is prepared before step a) by melting the alloy components at 700 to 900 °C and subsequent mixing.

12. The method according to claim 11, characterized in that the magnesium alloy is cast in moulds before step a), in particular at a temperature of 700 to 900 °C.

13. A medical implant, particularly in the form of a bone screw, a bone nail, a bone pin, a plate, a suture anchor, or the like for attaching soft tissues, especially tendons, muscles and ligaments, to a bone, or in the form of an endoprosthesis or at least a part thereof, obtainable in a process according to any one of claims 1 to 12.

14. The medical implant according to claim 13, characterized in that the implant is provided with a surface coating, in particular with a surface coating to control the rate of corrosion.

Claims

1. A method for producing a medical implant, particularly in the form of a bone screw, a bone nail, a bone pin, a plate, a suture anchor or the like for attaching soft tissues, particularly tendons, muscles and ligaments, to a bone, or in the form of an endoprosthesis or at least a part thereof, from a magnesium alloy consisting of a magnesium content of at least 80% by weight, a rare earth metal content from 2.5 to 5% by weight, an yttrium content from 1.5 to 5% by weight, a zirconium content from 0.1 to 2.5% by weight by weight, a zinc content from 0.01 to 0.8% by weight and unavoidable impurities, wherein the total content of possible impurities is less than 1% by weight and the aluminium content is smaller than 0.5% by weight,
and the remainder contains magnesium up to 100% by weight,
comprising the following steps:

a) melting the alloy components at 700 to 900 °C and then mixing them thoroughly to obtain a magnesium alloy, and pouring the magnesium alloy into moulds at a temperature of 700 to 900 °C,

b) melting the magnesium alloy to obtain an alloy melt,

c) atomising the alloy melt at a temperature from 775 to 850 °C and under a pressure from 17 to 23 bar in a protective gas atmosphere, and at the same time cooling the atomised alloy melt to below its solidification point to obtain an alloy powder,

d) shaping the alloy powder by compaction under cold istostatic conditions for obtain an alloy green body with at least 100 bar,

e) extruding the alloy green body to obtain a magnesium alloy moulded part, wherein the alloy green body is heated to a temperature from 300 to 400 °C before extrusion, and

f) production of the medical implant from the magnesium alloy moulded part.

2. The method according to claim 1, **characterized in that** in step c) the protective gas atmosphere is an inert gas atmosphere, particularly an argon and/or helium atmosphere.

3. The method according to claim 1 or claim 2, **characterized in that** the alloy powder has an average particle size from 5 to 50 µm, preferably from 10 to 30 µm, and particularly has a globular form.

4. The method according to any one of the preceding claims, **characterized in that** the compaction in step d) is carried out at a pressure of at least 80 bar, in particular under cold isostatic conditions.

5. The method according to claim 4, **characterized in that** in step d) the pressure is exerted by means of a gas atmosphere, particularly by an inert gas atmosphere.

6. The method according to any one of the preceding claims, **characterized in that** in step e) the extrusion is carried out using a punch on a die, which is at a temperature from 150 to 400 °C, particularly from 200 to 375 °C.

7. The method according to any one of the preceding claims, **characterized in that** the magnesium alloy consists of 5 to 9% by weight rare earth metals including yttrium, 0.1 to 0.8% by weight zirconium, 0.01 to 0.25% by weight zinc, the remainder being magnesium and possibly unavoidable impurities.

8. A medical implant, particularly in the form of a bone screw, a bone nail, a bone pin, a plate, a suture anchor, or the like for attaching soft tissues, especially tendons, muscles and ligaments, to a bone, or in the form of an endoprosthesis or at least a part thereof, obtainable in a process according to any one of claims 1 to 6.

9. The medical implant according to claim 8, **characterized in that** the implant is provided with a surface coating, in particular with a surface coating to control the rate of corrosion.