Claims

1. A wire implant, in particular for spiked wire osteosynthesis,

wherein the wire implant consists of a biocompatible, biocorrodible magnesium alloy composed of metallic magnesium of at least 80 wt.%, a zinc proportion of 0.1 to 2.0 wt.%, a zirconium proportion of 0.1 to 2.0 wt.%, a proportion of rare earth metals of 0.1 to 10 wt.%, wherein the yttrium content among the rare earth metal content proportion is 0.1 to 5.0 wt.% with respect to the entire magnesium alloy, a manganese proportion of 0.01 to 0.2 wt.%, an aluminium proportion of less than 0.1 wt.%, a proportion of copper, nickel and iron of less than 0.10 wt.% in each case, and a proportion of other physiologically undesirable impurities totalling less than 0.8 wt.%, wherein the remainder of the alloy is magnesium up to 100 wt.%,

characterised in that

~~the wire implant has undergone a heat treatment,~~

~~wherein the wire implant consists of a biocompatible, biocorrodible magnesium alloy composed of metallic magnesium of at least 80 wt.%, a zinc proportion of 0.1 to 2.0 wt.%, a zirconium proportion of 0.1 to 2.0 wt.%, a proportion of rare earth metals of 0.1 to 10 wt.%, wherein the yttrium content among the rare earth metal content proportion is 0.1 to 5.0 wt.%, a manganese proportion of 0.01 to 0.2 wt.%, an aluminium proportion of less than 0.1 wt.%, a proportion of copper, nickel and iron of less than 0.10 wt.% in each case, and a proportion of other physiologically undesirable impurities totalling less than 0.8 wt.%, wherein the remainder of the alloy is magnesium up to 100 wt.% .~~

the wire implant has undergone a heat treatment over the entire length of the wire or in at least one subsection of the wire implant,

wherein the heat treatment can be soft-annealed or solution-annealed;

wherein, when the wire is soft-annealed, said wire is soft-annealed at 400°C for 60 minutes and is cooled for 8 hours;

wherein the elongation at break in the soft-annealed region is at least 18%, preferably at least 20%, the yield strength in the soft-annealed region is at least 240 MPa, and the tensile strength in the soft-annealed region is at least 390 MPa;

wherein, when the wire is solution-annealed, said wire is solution-annealed at 490±10°C for 60 minutes, quenched in cold water and then aged at 180°C for 48 hours; wherein the elongation at break in the region subjected to aging is at most 3.5%, and the yield strength in the region subjected to aging is at least 360 MPa, preferably at least 380 MPa.

~~2. The wire implant according to the preceding claim,~~
~~characterised in that~~
~~the heat treatment takes place over the entire length of the wire or in at least one subsection.~~

~~3. The wire implant according to any one of the preceding claims,~~
~~characterised in that~~
~~the elongation at break in a soft-annealed region is at least 18%, preferably at least 20%.~~

~~4. The wire implant according to any one of the preceding claims 1 or 2~~
~~characterised in that~~
~~the elongation at break in a region subjected to aging is at most 3.5%.~~

~~5. The wire implant according to any one of the preceding claims,~~
~~characterised in that~~
~~the yield strength in a region subjected to aging is at least 360 MPa, preferably at least 380 MPa.~~

~~6. The wire implant according to any one of the preceding claims 1 to 4,~~
~~characterised in that~~
~~the yield strength in a soft-annealed region is at least 240 MPa.~~

~~7. The wire implant according to any one of the preceding claims,~~
~~characterised in that~~
~~the tensile strength in a soft-annealed region is at least 390 MPa.~~

~~8.~~ 2. The wire implant according to any one of the preceding claims,
characterised in that
the wire is round or polygonal or has longitudinal grooves.

~~9.~~ 3. The wire implant according to any one of the preceding claims,
characterised in that
the diameter is 0.2 mm to 6.0 mm, preferably 0.5 mm to 4.0 mm and the length is 30 mm to 600 mm, preferably 50 mm to 500 mm.

1~~0.~~ 4. The wire implant according to any one of the preceding claims,
characterised in that
the wire implant has a smoothly polished surface in at least one subsection.

~~11~~. 5. The wire implant according to any one of the preceding claims,
characterised in that
the wire implant has a roughness depth of less than 1.0 µm, preferably of 0.8 µm, in at least one subsection.

~~12~~. 6. The wire implant according to any one of the preceding claims,
characterised in that
the wire implant is hollow in at least one subsection.

~~13.~~ 7. A method for producing a wire implant according to one of the preceding claims,
~~characterised in that~~
~~the wire implant is heat-treated over the entire length of the wire or in at least one subsection of the wire implant,~~
wherein the wire implant consists of a biocompatible, biocorrodible magnesium alloy composed of metallic magnesium of at least 80 wt.%, a zinc proportion of 0.1 to 2.0 wt.%, a zirconium proportion of 0.1 to 2.0 wt.%, a proportion of rare earth metals of 0.1 to 10 wt.% with respect to the entire magnesium alloy, wherein the yttrium content among the rare earth metal content proportion is 0.1 to 5.0 wt.%, a manganese proportion of 0.01 to 0.2 wt.%, an aluminium proportion of less than 0.1 wt.%, a proportion of copper, nickel and iron of less than 0.10 wt.% in each case, and a proportion of other physiologically undesirable impurities totalling less than 0.8 wt.%, wherein the remainder of the alloy is magnesium up to 100 wt.% ,
characterised in that
the wire implant is heat-treated over the entire length of the wire or in at least one subsection of the wire implant,
wherein the solution annealing is carried out at a temperature of 300°C to 520°C, preferably from 350°C to 500°C, particularly preferably at 480°C and the solution annealing takes place over a period of 2 to 100 minutes, particularly preferably 3 to 60 minutes.

~~14.~~ 8. The method for producing a wire implant according to ~~one of the preceding claims~~ Claim 7,
characterised in that
solution annealing is carried out in a contactless manner by laser light or by inductive heating or by heating by means of infrared irradiation or in a standard muffle furnace.

~~15. The method for producing a wire implant according to one of the preceding claims,~~
~~characterised in that~~

~~the solution annealing is carried out at a temperature of 300°C to 520°C, preferably from 350°C to 500°C, particularly preferably at 480°C.~~

~~16. The method for producing a wire implant according to one of the preceding claims, characterised in that~~
~~the solution annealing takes place over a period of 2 to 100 minutes, particularly preferably 3 to 60 minutes.~~

~~17.~~ 9. The method for producing a wire implant according to ~~one of the preceding claims~~ Claim 7 or 8,
characterised in that
the low roughness of the implant surface is achieved by oscillating cross-grinding, mechanical grinding, polishing, lapping or by electrochemical polishing.

~~18.~~ 10. A wire implant obtainable by a method according to any one of the claims ~~13~~ 7 to ~~17~~ 9.