Si 0.70% to 1.0%,

Mn 0.70% to 0.90%,

Fe up to 0.20%,

Zn up to 0.08%,

Cu up to 0.05%,

Cr up to 0.03%,

Ti up to 0.06%,

unavoidable impurities each <0.03%, total <0.10%, balance aluminium;

(b) homogenizing of the rolling feedstock at a temperature in a range of 550°C to 595°C;

(c) hot-rolling of the homogenized rolling feedstock in one or more rolling steps to a hot-rolled plate having a thickness of at least 10 mm;

(d) solution heat-treatment ("SHT") of the hot rolled plate at a temperature in a range of 540°C to 590°C;

(e) rapid cooling the SHT plate;

(f) stretching of the cooled SHT plate to obtain a permanent elongation from 1% to 5%; and

(g) artificial ageing of the stretched plate, wherein the artificial ageing is performed at a temperature in the range of 150°C to 190°C and for a time of 5 to 60 hours.

In another aspect of the present disclosure, there is provided a method of manufacturing an aluminium alloy plate for vacuum chamber elements, valves, or total assemblies, the method comprising the steps of:

(a) providing a rolling feedstock material of an Al-Mg-Si aluminium alloy having a composition comprising of, in wt.%,

Mg 0.70% to 1.05%;

Si 0.70% to 1.0%;

Mn 0.60% to 1.0%;

Fe up to 0.20%;

Zn up to 0.2%;

Cu up to 0.10%;

Cr up to 0.05%;

Ti up to 0.1%;

Ni up to 0.06%;

unavoidable impurities each <0.05%, total <0.15%, balance aluminium;

(b) homogenizing of the rolling feedstock at a temperature in a range of 550°C to 595°C;

(c) hot-rolling of the homogenized rolling feedstock in one or more rolling steps to a hot-rolled plate having a thickness of at least 10 mm;

(d) solution heat-treatment ("SHT") of the hot rolled plate at a temperature in a range of 540°C to 590°C;

(e) rapid cooling the SHT plate;

(f) stretching of the cooled SHT plate to obtain a permanent elongation from 1% to 5%; and

(g) artificial ageing of the stretched plate, wherein the artificial ageing is performed at a temperature in the range of 150°C to 190°C and for a time of 5 to 60 hours.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a sample light microscope image for analysing the phases and particles of the aluminium alloy materials described herein.

DESCRIPTION OF THE INVENTION

As will be appreciated herein below, except as otherwise indicated, aluminium alloy designations and temper designations refer to the Aluminium Association designations in

WHAT IS CLAIMED IS:

1. A method of manufacturing an aluminium alloy plate for vacuum chamber elements, valves, or total assemblies, the method comprising the steps of:
   (a) providing a rolling feedstock material of an Al-Mg-Si aluminium alloy having a composition comprising of, in wt.%,
   Mg 0.80% to 1.05%,
   Si 0.70% to 1.0%,
   Mn 0.70% to 0.90%,
   Fe up to 0.20%,
   Zn up to 0.08%,
   Cu up to 0.05%,
   Cr up to 0.03%,
   Ti up to 0.06%,
   unavoidable impurities each <0.03%, total <0.10%, balance aluminium;
   (b) homogenizing of the rolling feedstock at a temperature in a range of 550°C to 595°C;
   (c) hot-rolling of the homogenized rolling feedstock in one or more rolling steps to a hot-rolled plate having a thickness of at least 10 mm;
   (d) solution heat-treatment ("SHT") of the hot rolled plate at a temperature in a range of 540°C to 590°C;
   (e) rapid cooling the SHT plate;
   (f) stretching of the cooled SHT plate to obtain a permanent elongation from 1% to 5%; and
   (g) artificial ageing of the stretched plate, wherein the artificial ageing is performed at a temperature in the range of 150°C to 190°C and for a time of 5 to 60 hours.

2. The method according to claim 1, wherein the hot rolling of the homogenized rolling feedstock is to a plate having a thickness in the range of 10 mm to 230 mm.

3. The method according to claim 1 or 2, wherein the Mg-content is in a range of 0.85% to 1.05%.

4. The method according to any one of claims 1 to 3, wherein the Si-content is in a range of 0.70% to 0.95%.

5. The method according to any one of claims 1 to 4, wherein the ratio (in wt.%) Mg/Si is more than 0.9.

6. The method according to any one of claims 1 to 5, wherein the Mn-content is in a range of 0.75% to 0.85%.

7. The method according to any one of claims 1 to 6, wherein the Fe-content is up to 0.12%.

8. The method according to any one of claims 1 to 7, wherein the Ti-content is in a range of 0.01% to 0.06%.

9. The method according to any one of claims 1 to 8, wherein homogenizing of the rolling feedstock is at a temperature in a range of 555°C to 595°C.

10. The method according to any one of claims 1 to 9, wherein the solution heat treatment of the hot rolled plate is at a temperature in a range of 545°C to 580°C.

11. The method according to any one of claims 1 to 10, wherein the rapid cooling is performed by one of spray quenching or immersion quenching in water or other quenching media.

12. The method according to any one of claims 1 to 11, wherein the artificial ageing is performed to achieve a T6 temper.

13. The method according to any one of claims 1 to 12, further comprising the steps of:

(h) machining said aged plate into a vacuum chamber element, a valve, or a total assembly; and

(i) surface treating of the vacuum chamber element, the valve, or the total assembly.

14. The method of claim 13, wherein the surface treating is performed by anodization.

15. The method of any one of claims 1 to 14, wherein the aluminum alloy plate has a density of phases and particles having a size greater than 10 μm^2 of less than 400 phases per mm^2.

16. A method of manufacturing an aluminium alloy plate for vacuum chamber elements, valves, or total assemblies, the method comprising the steps of:

(a) providing a rolling feedstock material of an Al-Mg-Si aluminium alloy having a composition comprising of, in wt.%,

Mg 0.70% to 1.05%;
Si 0.70% to 1.0%;
Mn 0.60% to 1.0%;
Fe up to 0.20%;
Zn up to 0.2%;
Cu up to 0.10%;
Cr up to 0.05%;
Ti up to 0.1%;
Ni up to 0.06%;

unavoidable impurities each <0.05%, total <0.15%, balance aluminium;

(b) homogenizing of the rolling feedstock at a temperature in a range of 550°C to 595°C;

(c) hot-rolling of the homogenized rolling feedstock in one or more rolling steps to a hot-rolled plate having a thickness of at least 10 mm;

(d) solution heat-treatment ("SHT") of the hot rolled plate at a temperature in a range of 540°C to 590°C;

(e) rapid cooling the SHT plate;

(f) stretching of the cooled SHT plate to obtain a permanent elongation from 1% to 5%; and

(g) artificial ageing of the stretched plate, wherein the artificial ageing is performed at a temperature in the range of 150°C to 190°C and for a time of 5 to 60 hours.

17. The method according to claim 16, wherein the rapid cooling is performed by one of spray quenching or immersion quenching in water or other quenching media.

18. The method according to any one of claims 16 and 17, wherein the artificial ageing is performed to achieve a T6 temper.