

ALIEN PROPERTY CUSTODIAN

ALUMINIUM ALLOYS

Gaston Gauthier, Chambéry (Savoie), France;
vested in the Alien Property Custodian

No Drawing. Application February 1, 1941

Aluminium alloys containing, as main added elements, zinc, magnesium and copper, are well known; they have been much studied, as their characteristics are relatively high, although in fact, only slightly superior to those of Al-Zn alloys of high Zn content.

The extremely surprising fact has been noticed that the addition of small quantities of chromium has the effect of raising in quite an unexpected manner, the mechanical characteristics of said alloys. An addition comprised between 0.01 and 2% is sufficient. This proportion obviously depends on the contents of the alloy in other constituents. These contents can be the following:

- Zn up to 15%
- Mg from 1.5 to 7%
- Cu up to 5%
- Ni up to 3%
- Al=substantially the remainder.

By Al=substantially the remainder, it must be understood that the alloy inevitably contains the impurities, impossible to avoid, which technical metallurgical products always contain, even when, eventually, they have been chosen amongst the most pure.

The addition of chromium can be effected by any of the usual technical means, such as, by way of example: by addition of the metal itself, of an aluminium-chromium mother alloy, or of a mother alloy the main ingredient of which is aluminium containing, in addition to chromium, other constituents of the alloy, or again a chromium alloy with one or more of the other constituents. The chromium or some of the other constituents can also be added in the form of salts from which the chromium is freed by double reaction with the liquid metal bath.

To the alloys according to the invention can, of course, be added the known additional elements for refining the grain and facilitating the plastic distortions, such as Zr, V, Ti.

Likewise, use can also be made, for these alloys, of casting processes or specially known ingot moulds for avoiding or diminishing the importance of the segregations.

The alloys can be used after heat treatment consisting in completely or partially dissolving them by a heating operation the duration of which depends, as is well known, on the structure and composition of the alloy, and the tem-

perature of which is comprised between 350° C. and the temperature at which melting begins; this heating is followed by a sudden cooling in the open air, in oil or in water. This treatment can be completed by a precipitation treatment effected by heating at a temperature which can be raised from the surrounding temperature up to about 400° C., and the duration of which varies according to the degree of mechanical resistance desired.

The addition of chromium must be carefully proportioned to the composition of the alloy. By way of example, the following compositions can be cited:

Example 1.—The alloy contains: Mg 2.5%—Zn 8.4%—Cu 1.5%—Cr 0.4%. It is rolled into sheets 1 m/m thick, by hot rolling, then by cold rolling. These sheets are heated to 460° C. for two hours, then quenched in water. They have the following characteristics:

Tensile strength: 46 kg/mm²—Elastic limit: 29.5—Elongation 9.5—Brinnell number: 94.

The same alloy, after a precipitation treatment at 125° C for 10 hours, showed:

Tensile strength: 73 kg/mm²—Elastic limit: 69—Elongation: 5—Brinnell number: 170.

Example 2.—The alloy contains: Mg 1.9%—Zn 8%—Cu 1.5%—Cr 0.25%. It is extruded in the press into round bars, rendered homogeneous by heating at 460° C. for two hours, then quenched in water. It has the following characteristics:

Tensile strength: 47 kg/mm²—Elastic limit: 31—Elongation: 14.

The same alloy after precipitation treatment at 125° C. for 10 hours, showed:

Tensile strength: 65.4—Elastic limit: 61—Elongation 9.5.

Example 3.—The alloy contains Mg 2.5%—Zn 8%—Cr 0.5%. It is extruded in the press into round bars, rendered homogeneous by heating at 460° C. for two hours, then quenched in water. It presents the following characteristics:

Tensile strength: 42.3—Elastic limit: 28.4—Elongation: 11.5—Brinnell number: 126.

The same alloy, after precipitation treatment at 125° C. for 10 hours, showed:

Tensile strength: 66.1—Elastic limit: 65—Elongation: 5.7—Brinnell number: 164.

GASTON GAUTHIER.