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(54) **ALLIAGE ALUMINIUM-MAGNESIUM SOUDABLE, A HAUTE TENEUR EN MAGNESIUM, RESISTANT A LA CORROSION, DESTINE NOTAMMENT A DES APPLICATIONS DANS L'AERONAUTIQUE**

(54) **WELDABLE ANTI-CORROSIVE ALUMINIUM-MAGNESIUM ALLOY CONTAINING A HIGH AMOUNT OF MAGNESIUM, ESPECIALLY FOR USE IN AVIATION**

(57) L'invention concerne un alliage aluminium-magnésium soudable, à haute teneur en magnésium, résistant à la corrosion, contenant au moins 5 à 6 % en poids de magnésium (Mg), 0,05 à 0,15 % en poids de zirconium (Zr), 0,05 à 0,12 % en poids de manganèse (Mn), 0,01 à 0,2 % en poids de titane (Ti), 0,05 à 0,5 % en poids d'un ou plusieurs éléments du groupe du scandium et/ou de terbium (Tb), avec au moins une proportion de scandium (Sc), 0,1 à 0,2 % en poids de cuivre (Cu) et/ou 0,1 à 0,4 % en poids de zinc (Zn), ainsi que de l'aluminium (Al) et des impuretés inévitables avec au maximum 0,1 % en poids de silicium (Si).

(57) A weldable anti-corrosive aluminium-magnesium alloy containing a high amount of magnesium comprising at least 5-6 wt. % magnesium (Mg), 0.05-0.15 wt. % zirconium (Zr), 0.05-0.12 wt. % manganese (Mn), 0.01-0.2 wt. % titanium (Ti), 0.05-0.5 wt. % of one or several elements from the scandium group and/or terbium (Tb), whereby at least scandium (Sc) is contained, 0.1-0.2 wt. % copper (Cu) and/or 0.1-0.4 wt. % zinc (Zn) in addition to aluminium (Al) and unavoidable impurities with a maximum of 0.1 wt. % silicon.

## ABSTRACT

Weldable, high-magnesium-content aluminum-magnesium alloy consisting of at least 5 - 6 %w/w magnesium (Mg), 0.05 - 0.15 %w/w zirconium (Zr), 0.05 - 0.12 %w/w manganese (Mn), 0.01 - 0.2 %w/w titanium (Ti), 0.05 - 0.5 %w/w of one or more elements from the scandium group and/or terbium (Tb), wherein at least scandium (Sc) is included, 0.1 - 0.2 %w/w copper (Cu) and/or 0.1 - 0.4 %w/w zinc (Zn), along with aluminum (Al), and unavoidable contamination does not exceed 0.1 %w/w silicon (Si).

# New Weldable, Corrosion-Resistant, High-Magnesium-Content Aluminum-Magnesium Alloy, in particular for Aeronautics Applications

The invention relates to a weldable, corrosion-resistant, high-magnesium-content aluminum-magnesium alloy, which contains a ternary aluminum-scandium-zirconium phase as the essential component. Such an alloy is known from US 5,624,632, for example, and is of interest above all for applications in aeronautics due to its low density, high strength and corrosion resistance. Adding rare earth or rare earth-like elements generates dispersoids in the aluminum-magnesium alloy, which produce a higher strength and corrosion resistance according to the above US patent. The above US patent makes no statement as to the weldability of such an alloy.

The object of this invention is to provide a weldable, corrosion-resistant, high-magnesium-content aluminum-magnesium alloy, which is at least as good as the known alloy in terms of strength and corrosion behavior, and exhibits a high recrystalization threshold to go along with a good weldability. This object is achieved by an aluminum-magnesium alloy according to claim 1.

In comparison to the known alloy, this new alloy exhibits above all a distinctly lower manganese share, wherein an improved corrosion resistance was surprisingly found, primarily in the sensitized state of the parts made out of this alloy, e.g., when cold-formed parts are subjected to an elevated temperature over a prolonged period. It is assumed that these positive properties are determined primarily by the ratio of manganese to scandium. An improved corrosion resistance is observed at a ratio of Mn to Sc < 2. Along with acting as a grain growth inhibitor, the

titanium share not present in the known alloy helps to increase strength, since titanium can replace the zirconium in the ternary Al-Sc-Zr phase, wherein the solubility of titanium is lower than that of zirconium, however.

The addition of Cu and/or Zn increases the strength, which can be traced back to the known high strength of the Al-Cu or Al-Zn phase. The respective upper concentration limits are selected to prevent the Cu from diminishing the weldability above all, and the Zn from diminishing the corrosion resistance.

It has also been shown that scandium can be replaced by terbium, at least within certain limits. However, more terbium than the amount of scandium being replaced must be added to achieve constant properties.

A particularly strong and corrosion-resistant alloy contains at least 0.15 %w/w scandium. Lanthanidene is preferably added in amounts ranging from 0.05 and 0.35 %w/w, wherein this range relates to the total mixture when using a lanthanidene mixture. The alloy tolerates silicon contamination of up to 0.1 %w/w; primarily the dynamic properties deteriorate at above this level.

# CLAIMS

1. Weldable, corrosion-resistant high-magnesium-content aluminum-magnesium alloy consisting of at least 5 - 6 %w/w magnesium (Mg), 0.05 - 0.15 %w/w zirconium (Zr), 0.05 - 0.12 %w/w manganese (Mn), 0.01 - 0.2 %w/w titanium (Ti), 0.05 - 0.5 %w/w of one or more elements from the scandium group and/or terbium (Tb), wherein at least scandium (Sc) is included, 0.1 - 0.2 %w/w copper (Cu) and/or 0.1 - 0.4 %w/w zinc (Zn), along with aluminum (Al), and unavoidable contamination does not exceed 0.1 %w/w silicon (Si).

2. AlMg alloy according to claim 1, characterized by the fact that the ratio of manganese to scandium is less than 2.

3. AlMg alloy according to claim 1 or 2, characterized by the fact that at least 0.15 %w/w scandium (Sc) is included.

4. AlMg alloy according to one of the claims 1 to 3, characterized by the fact that 0.05 - 0.35 %w/w of one or more elements of lanthanidene, in particular Cer (Ce), neodyme (Nd), Europium (Eu), gadolinium (Gd), dysprosium (Dy), holmium (Ho) or erbium (Er) is included.

5. Welded component for an airplane, in particular for a fuselage, consisting of an AlMg alloy according to one of claims 1 to 4.