Technology Offer

# Ultra-High Strength Aluminum Alloy

Field of use:
Materials

Current state of technology:
Prototype

Intellectual property:
Patent LU503252

Developed by:
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## Background

Sveeral strengthening mechanisms are generally known for aluminum-based alloys, such as: Work hardening, precipitation hardening (artificial and natural aging), strengthening by dispersion of intermetallic phases or particles, solid solution and grain size refinement. Tensile strengths between 550 MPa and 600 MPa can be achieved in wrought aluminum alloys by the usual strengthening mechanisms, but at reduced elongation (about 10%). In cast aluminum alloys (e.g. AlSi12CuNiMg), a tensile strength of up to 400 MPa can be achieved at about 5% elongation. If we want to produce a new aluminum alloy with a tensile strength of more than 600 MPa, we need to use a completely new strengthening mechanism with thermodynamic non-equilibrium structures such as amorphous and quasicrystalline phases. The disadvantage of these alloys is that the high strengths were measured on alloys produced with rapid cooling technologies that allow cooling rates of 103 to 106 K/s.

## Description of the invention

The inventors have succeeded in synthesizing and controlling the formation of the primary metastable phase at cooling rates above 100 K/s by adding carefully selected chemical elements and crystallizers. This enables the industrial production of new alloys in the form of rods, plates and other complex shapes with a maximum wall thickness/diameter of 10 mm.

## The main advantages

The main advantages over commercial wrought and cast aluminum alloys are:

- lower material consumption and lower production costs with the same functionality
- lower negative impact on the environment and human health
- quantitatively available and affordable alloying elements