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Research Article

EFFECT OF GERMANIUM OXIDE ON ALUMINUM ALLOY STRUCTURE

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ABSTRACT

The article investigates the effect on the change in the structure of the alloy of the element germanium on the alloy grade D 16 from alloys of the aluminum-copper system using experiments. The study showed how it changes the microstructure of the alloy.

KEYWORDS

Alloying elements, germanium, oxide, microstructure, phase, alloy.

INTRODUCTION

A number of scientific studies of aluminum alloys are aimed at obtaining high-quality foundry products with increased casting and mechanical properties. The world's leading countries in this field are Canada, the USA, Japan, China, Sweden, Germany, Russia, Ukraine and others. In the above-mentioned countries and in Uzbekistan in the following years, due to the increase in the number of non-ferrous alloys in the production of foundry products in the foundry industry, much attention is paid to the creation of technology for obtaining high-quality, durable foundry products based on an effective method that ensures resource conservation. Based on experiments, the article analyzes the change in the structure of the D16 alloy under the influence of Germanium, which is one of the alloys of the aluminum-copper system.

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Materials and methods. The studies studied the effect of Germanium oxide on the microstructure of the D16 alloy in the aluminum-copper system.Aluminum alloy D16 (duralumin, duralumin) is a durable material from which metal plates, sheets, rods, corners and other deformable structures are made. Copper, magnesium and manganese are present in it as alloying elements. Duralumin D16 is not intended for welding, parts made of this material are usually mounted using special fasteners and rivets. Due to its lightness and mechanical resistance, on can be used even in the aircraft industry and the space industry.

Table-1.

Chemical composition of D16 brand aluminum alloy.

Al	Fe	Si	Mn	Cr	Ti	Cu	Mg	Zn	Compounds	-
90.9-94.7	till 0.5	till 0.5	0.3-0.9	till 0.1	till 0.15	3.8-4.9	1.2-1.8	till 0.25	till 0.15	Ti+Zr<0.2

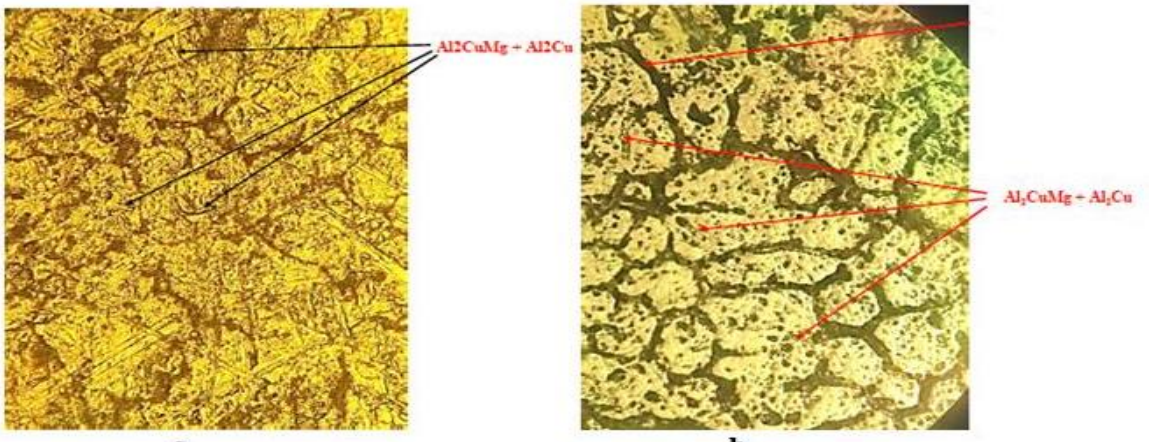

Figure 1. Sample microstructure: a - D16; b-D16+ 0.1% GeO.

The chemical composition of the D16 brand alloy is given in Table 1. This aluminum alloy has an aluminum content of 94.7%. The main legalizing element copper is 4.9%. The furnace used is mainly designed to produce small-scale details, and 3 kg of metal can be liquefied in tigeli. The crucible of the furnace is made of graphite material, which helps to pour all of the liquid metal without sticking to the base of the Crucible. The aluminum alloy content was kirtened from 0.1% to 0.3% germanium oxide, and the samples were poured into sand-clay molds.

RESULTS

The poured samples were shuddered and microshlifts were made. Structural analysis of the finished samples was carried out using an optical metthalographic microscope. Microstructures of samples are shown in Figure 1 and Figure 2. Figure 1-"a" is an aluminum-copper solid with no germanium oxide added, and "b"

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is given a microstructure of the added sample by calculating that 0.1% of the alloy remains germanium

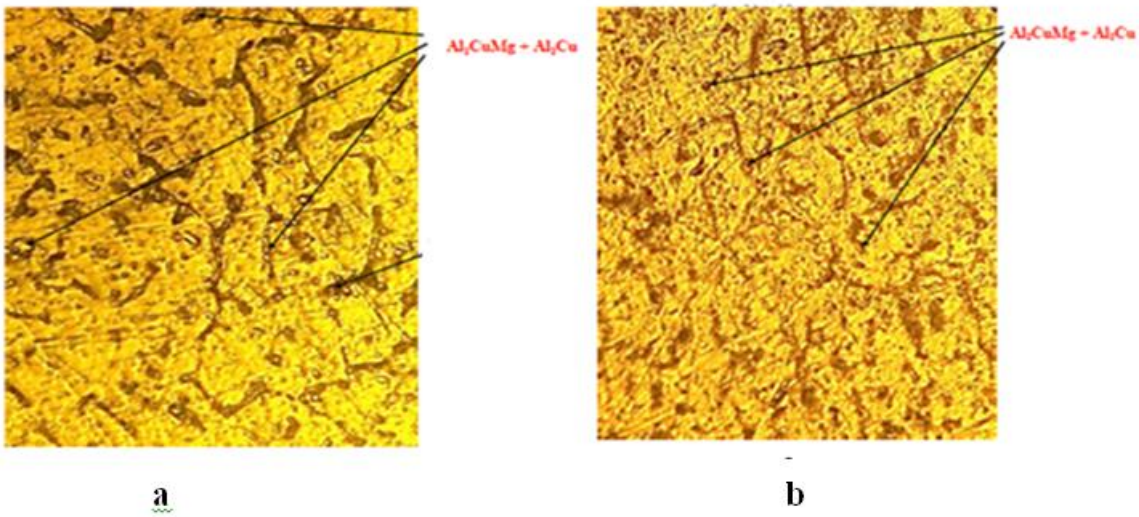

Figure 2. Sample microstructure: a - D16+0.2% GeO; b-D16+ 0.3% GeO.

CONCLUSION

Of the samples from the experiments carried out above, the following can be concluded:

1. The microstructure of the D16 alloy represents the base metal, where the main component is a solid solution of copper and magnesium in aluminum and the intermetallide phases Al2CuMg and Al2Cu. The flow furnaces located near the Intermetallid clusters and the intermittent of the euthectic were not visually identified. Grain size No. 7-8 according to GOST 5639-82. Intermetallide grains are columnar, elongated 9-10x3 microns.
2. Grain size No. 6 according to GOST 5639-82. The effect maximally crushed 0.1% germanium intermetallide grains (5-6 microns).
3. Grain size No. 6-7 according to GOST 5639-82. The effect crushed 0.2% germanium intermetallide grains (3-4 microns).
4. Grain size No. 7-8 according to GOST 5639-82. The effect crushed 0.3% germanium, intermetallide grains (2-3 microns).

From the results of the study, it was found that germanium contained in germanium oxide remained in its composition in the process of liquefying aluminum alloy, grinding the microstructure of the alloy. When germanium is added in an amount of 0.3% compared to starch, the alloy grains are ground to 2-3 microns. From this it can be concluded that the element germanium improves the microstructure of aluminum alloys.

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17.