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Effect of LiF compound on gas porosity in aluminum alloy

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The article analyzes the effect of a lithium fluoride compound on the gas porosity in an aluminum alloy composition when alloying an aluminum alloy with a lithium fluoride compound. In experiments, the process of obtaining a lithium fluoride compound by interacting with harmful aluminum gas additives in the process of fluoride alloying was identified. Based on these experiments, the authors draw their own conclusions.

Keywords: Lithium, fluorine, gas porosity, alloying, aluminum

Aluminum alloys with lithium are considered promising for the engineering and aerospace industries. An urgent task is to improve the physical, mechanical and operational properties of alloys of this group by alloying them. The growing interest in these alloys is explained by the fact that lithium, whose density is 0.54 g/cm3, simultaneously increases the modulus of elasticity of aluminum, thereby reducing the mass of products made from its alloys. The addition of rare metals to aluminum alloys increases their durability, heat resistance, corrosion resistance. Unique metals have the effect of modification and grind crystalline particles. Obtaining aluminum-lithium alloys, which are rare metals, is difficult due to the high reactivity of the components that make up aluminum [1-2]. Reducing the content of non-metallic additives and gases in aluminum alloys is one of the urgent problems of today. The manufacture of harmful porous alloys in gases leads to a decrease in the service life of parts. The article analyzes the gas porosity to be enriched in alloyed aluminum parts using a combination of lithium fluoride [3-4].

Aluminum grade A 000 and a combination of lithium with lithium fluoride were obtained as the object of research for experiments. The experiments were carried out in a muffle furnace of the brand snol-1,6.2,5.1/11– i2m. The studies were conducted in 2 different ways. In the first method, a combination of lithium fluoride in a closed seal was added. In the second method, a combination of lithium fluoride was added to the open seal. Before the experiments, the fiber combination was prepared by wrapping 5 g in aluminum foil (Fig. 1) [5-6].

Both methods included a combination of lithium fluoride from 5 g to 15 g in the composition of flux in the studied samples. Then the total weight of the bag consists of a combination of lithium fluoride, which ranges from 5% to 15%. To compare the samples, first of all, an aluminum alloy of the xech brand A000 was poured without any additives. For all samples, the same amount of Tig of 100 grams was applied to the charge. Samples of parts were poured into pre-prepared sand-clay molds. After that, microscopic analysis of the samples was carried out [7].

Figure-1. LiF wrapped in aluminum foil.

For this purpose, in their experiments, the JMS-IT200 model was used an electronic microscope (Fig.2).

Figure-2. Electronic microscope.

A microscopic image of aluminum grade A000 is shown in Figure 3. Microscopic images of samples with the addition of lithium fluoride are shown in Figure 4 [8-9]. In the images obtained, a microscopic image of aluminum grade A000 shows a large amount of micro-gas porosity. And in the aluminum alloy, which is legalized with lithium fluoride, it became known that the gas porosity is not visible. The fluoride contained in lithium fluoride caused a decrease in the amount of harmful gases [10-11].

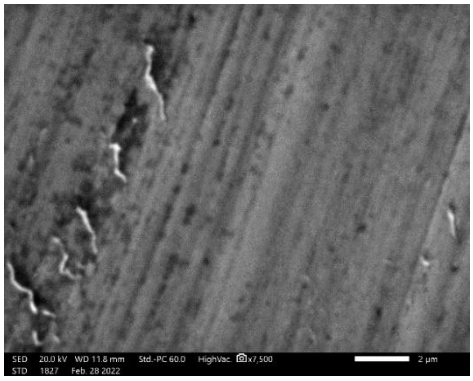

Figure-3. Microscopic image of A000 brand aluminum alloy.

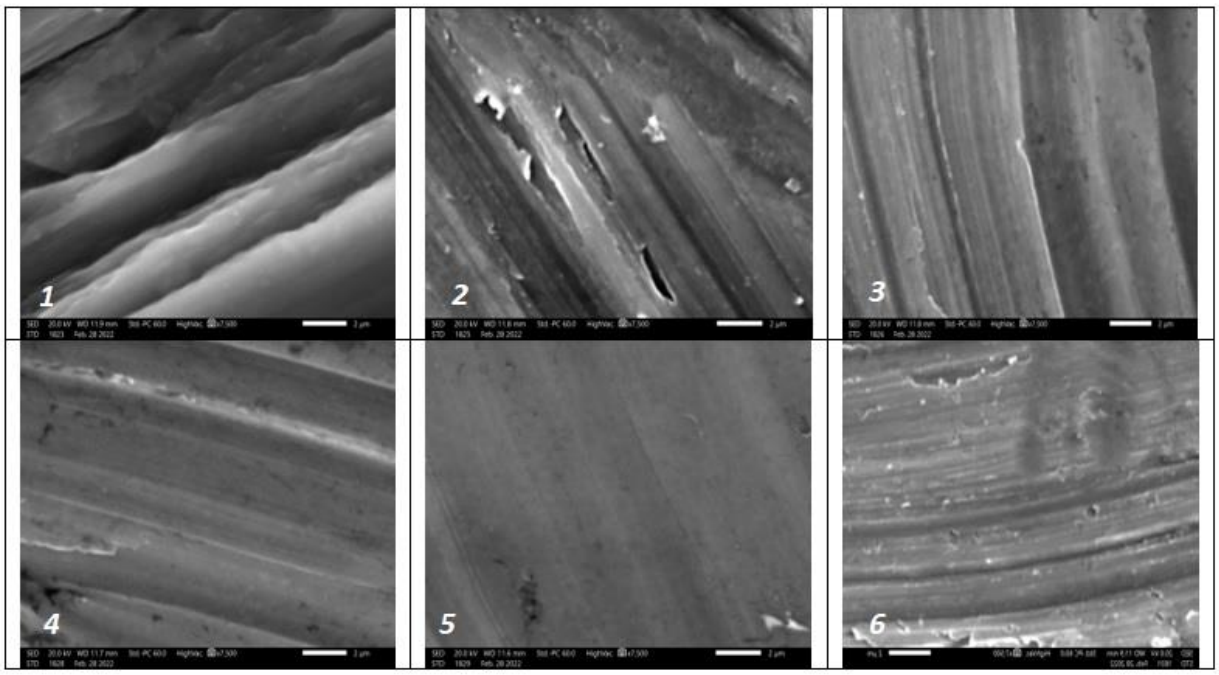

Figure-4. Microscopic images of samples to which lithium fluoride has been added.1,2,3-samples added in an open environment. 4,5,6-samples added in a closed environment.

The analysis showed that the amount of harmful gases in aluminum samples alloyed with lithium fluoride significantly decreased. As a result of the addition of lithium fluoride, harmful gases in aluminum samples led to a decrease in gas porosity in the samples.

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