UKRAINE TEAM

United Nations Educational, Scientific and Cultural Organization

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IMPROVEMENT OF THE TECHNOLOGY OF OBTAINING POROUS ALUMINUM

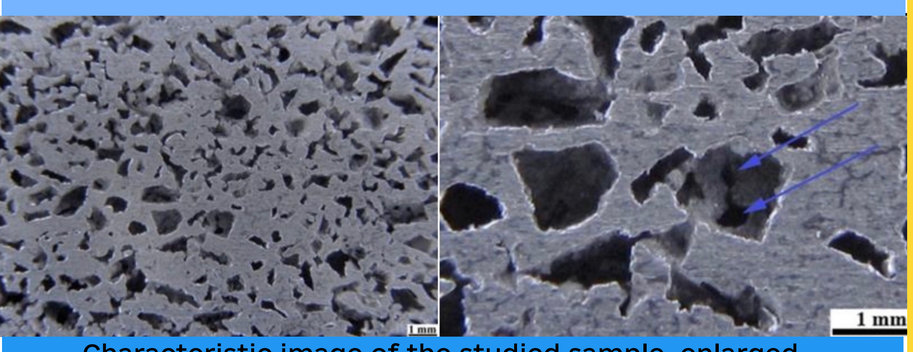
INTRODUCTION

During the work, a theoretical study of the existing methods of obtaining porous aluminum was carried out, as well as a practical study of the strength of the porous material was conducted based on the obtained samples.

In our opinion, a deeper study of the technological parameters of infiltration, which affect the formation of the structure, porosity, and mechanical properties of porous aluminum, is expedient.

TASKS

Research the technology of obtaining porous aluminum. Study of the main mechanical properties of the obtained samples.



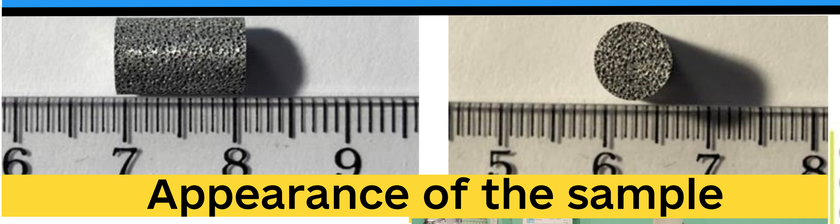
Characteristic image of the studied sample, enlarged image of the area with apertures

RESEARCH PROGRESS AND METHODS

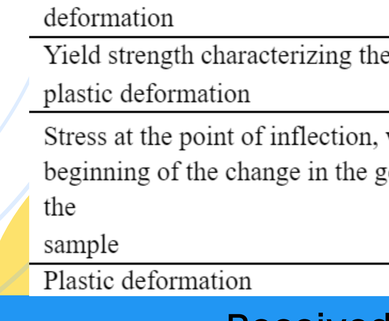
A theoretical study was carried out during the work on existing methods of obtaining porous aluminum, as well as the practical development of the technology of obtaining was carried out of porous aluminum using salt and vacuum with the subsequent study of the structure, porosity, density, modulus of elasticity, yield strength, plastic deformation of received samples.

Porous material was created in laboratory conditions by percolation of NaCl salt by melting on the basis of aluminum using a vacuum.

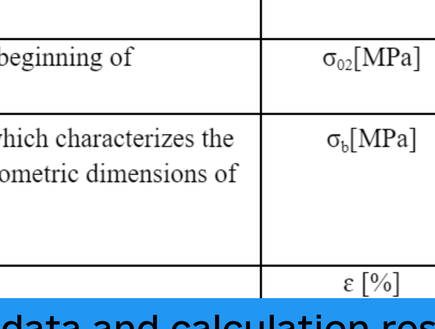
Tests of the received samples for strength were carried out on a certified universal machine "CERAMTEST" with a capacity of up to 10 tons, the structure of the samples was studied with the help of an electron microscope, and the mechanical parameters were



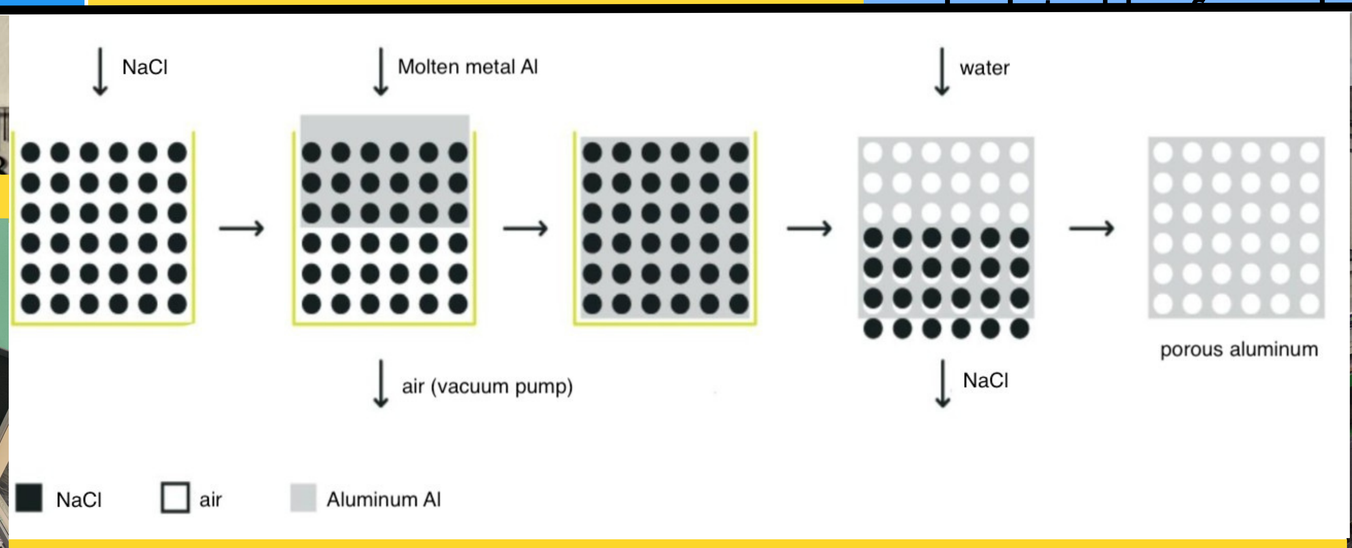
Appearance of the sample



Load diagram for uniaxial compression



Me and metallographic microscope "Neophot 21"



The process of creating porous aluminum with salt as a blowing agent

I melt aluminum

CONCLUSIONS

Mechanical properties of the obtained sample porous material (cylindrical shape, - 7 mm, h = 11 mm)	Designation and units measurement	Receiving the results
Sample volume	$V_{PA}[m^3]$	$4.233*10^{-7}$
Sample weight	$M_{PA}[kg]$	$4*10^{-4}$
Sample density	$\rho_{PA}[kg*m^{-3}]$	$9.44*10^{-4}$
Relative density of the sample	$\rho_{rel}[1]$	0.3499
Sample porosity	$P_{PA}[\%]$	65.035
Young's modulus (modulus of elasticity)	$E_{PA}[MPa]$	89.41
Yield strength characterizing elastic deformation	$\sigma_{001}[MPa]$	6.1
Yield strength characterizing the beginning of plastic deformation	$\sigma_{02}[MPa]$	9.44
Stress at the point of inflection, which characterizes the beginning of the change in the geometric dimensions of the sample	$\sigma_b[MPa]$	21.46
Plastic deformation	ε [%]	24.74

Received data and calculation results

1. It is shown that the size of the filler does not affect the total the porosity of the samples is 65%

2.Salt crystals require preliminary heat treatment to remove excess air and moisture.

3. The size of the pores is smaller than the size of the initial particles of the filler, which is due to the partial destruction of the filler in the impregnation process.

4. The mechanical properties of the samples correlate with the theoretical ones the idea of mechanical behavior under compression conditions.

5. The developed technology is promising for the industrial production of porous aluminum.