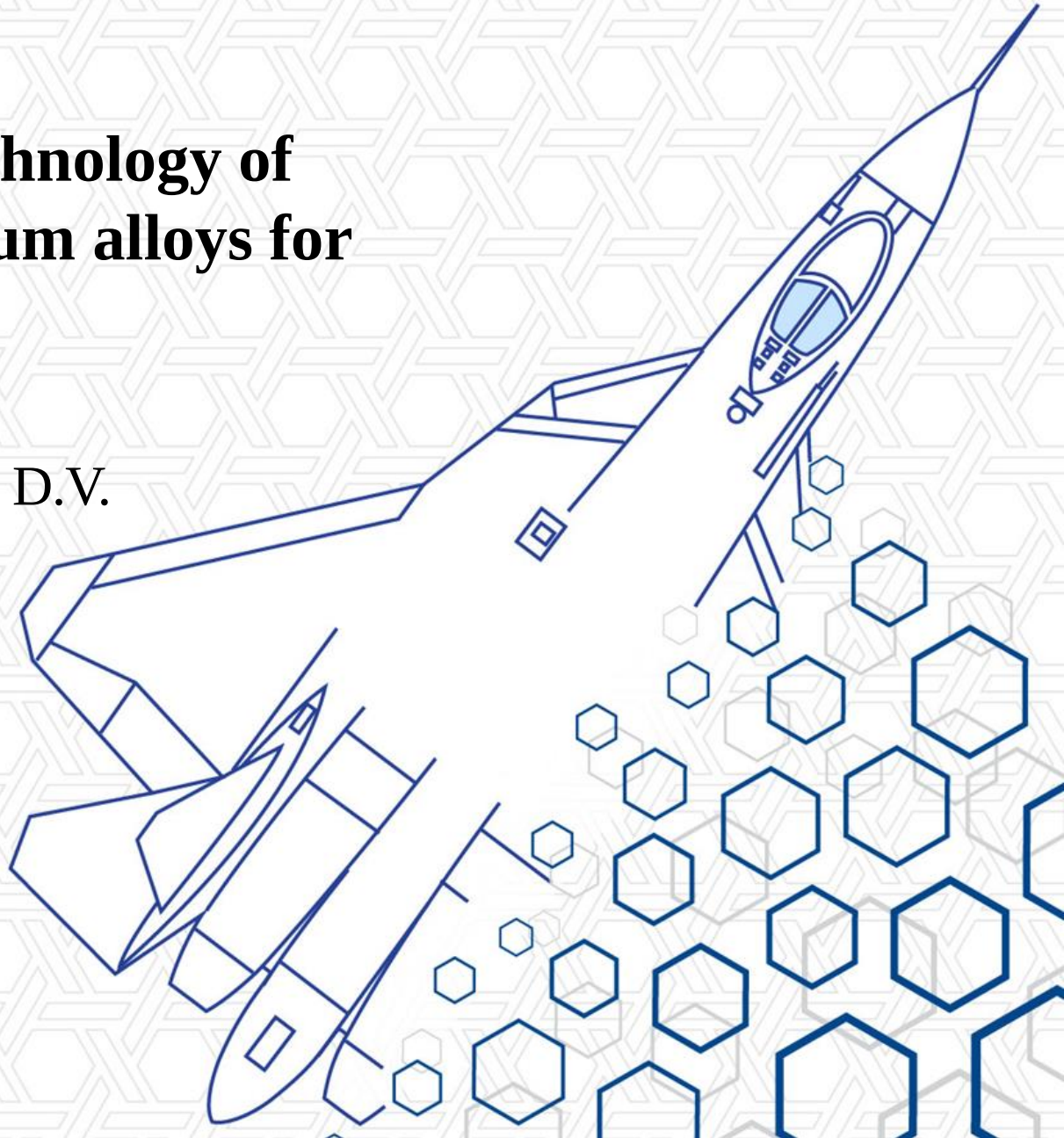
FEDERAL STATE UNITARY ENTERPRISEALL-RUSSIAN SCIENTIFIC RESEARCH INSTITUTE OF AVIATION MATERIALSSTATE RESEARCH CENTER OF THE RUSSIAN FEDERATION

«Environmentally superior technology of surface preparation of aluminum alloys for bonding»

Kozlov I.A., Antipov V. V., Chesnokov D.V.



Traditional technologies of surface preparation of aluminum alloys

Chromium anodizing

Dignity:

- The protective properties of 336 hours;
- High adhesion surface
- Minimum technological operations

Disadvantages:

- Toxic solution

Phosphoric anodizing

Dignity:

- High adhesion
- Low toxicity

Disadvantages:

- Low protection

Sulfuric acid anodizing

Dignity:

- High protection
- Low toxic

Disadvantages:

- Low adhesion of a surface

Pickling

Dignity:

- High adhesion of a surface

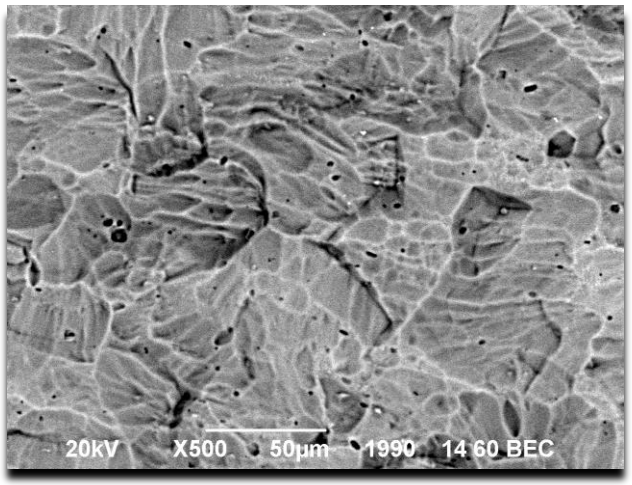
Disadvantages:

- low protection
- Toxic solution

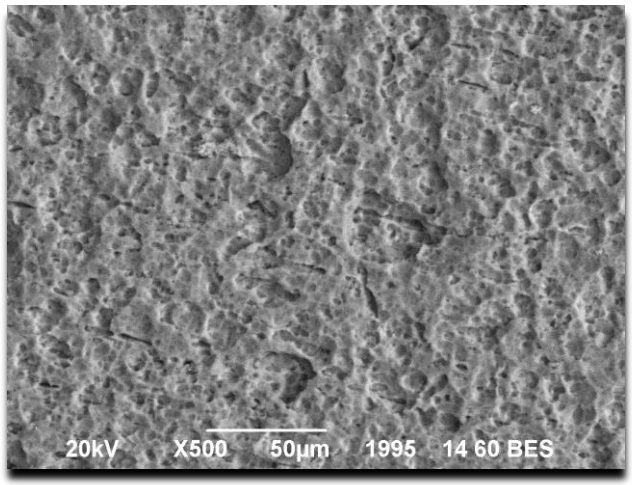
Pasting durability. Binder “ВСК-14-2М”. Alloy “V-1469”

Solution	Thickness, micron	Durability at shift, MPa	
		indicator	Nature of destruction (к - kogesion, a – adhesion)
Chromium anodizing	2,1	$\frac{32,4}{31,6 - 33,6}$	70%К 30%А
Sulfuric acid anodizing	5,2	$\frac{21,2}{17,3 - 23,5}$	10%К 90%А
Phosphoric anodizing	0,4	$\frac{32,0}{31,2 - 33,6}$	70%К 30%А
Pickling	-	$\frac{35,0}{35,5 - 36,5}$	75%К 25%А

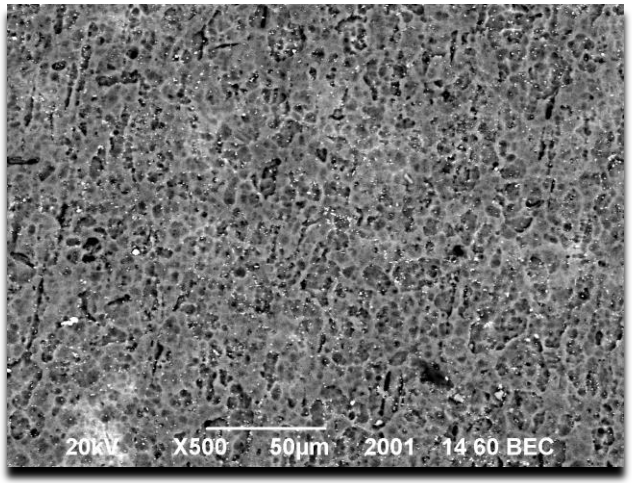
Surface of aluminum alloy “V-1469”



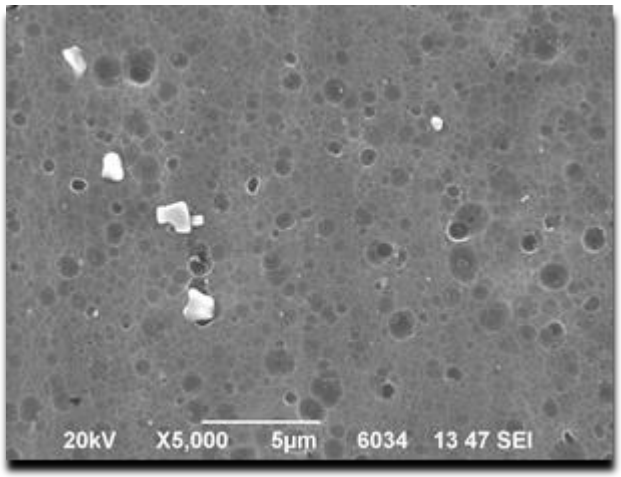
Sulfuric acid anodizing



Phosphoric anodizing

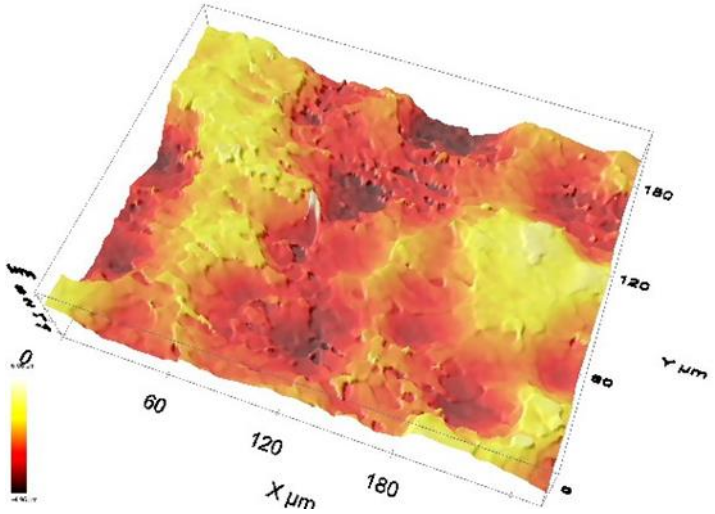


Chromium anodizing

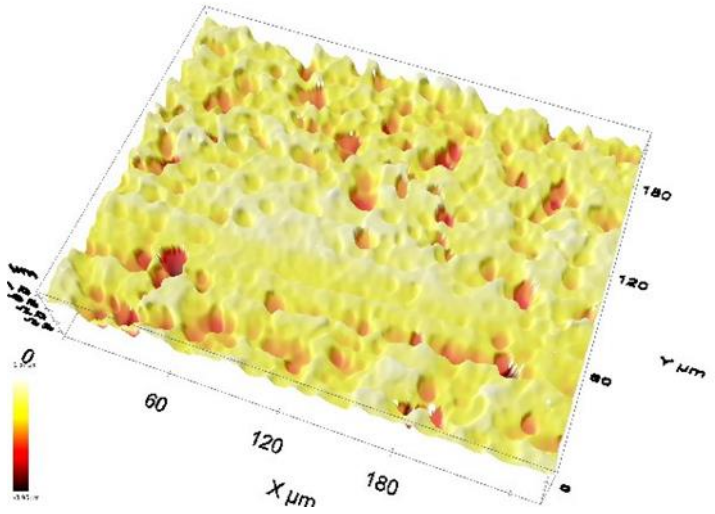


Pickling

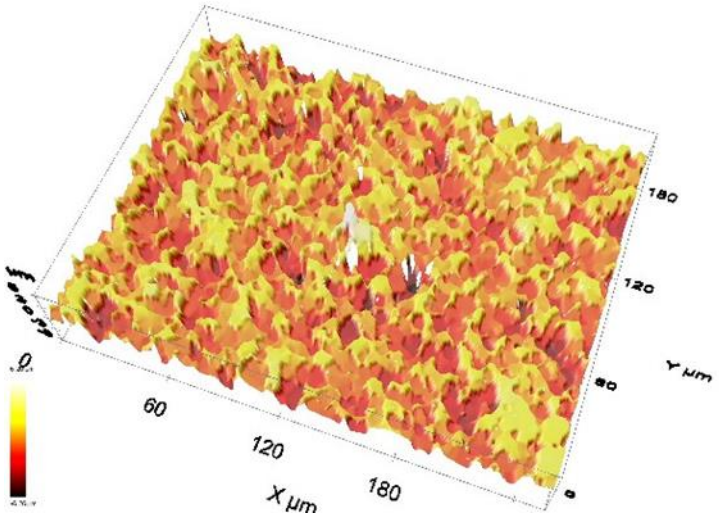
Surface of aluminum alloy “V-1469”



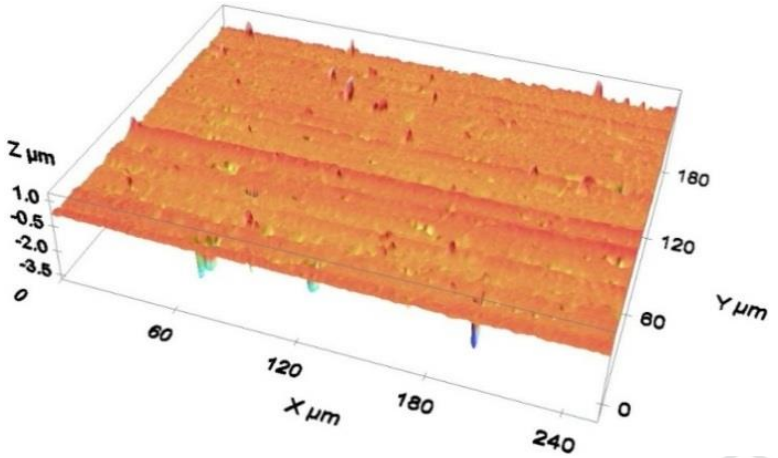
Sulfuric acid anodizing



Phosphoric anodizing



Chromium anodizing



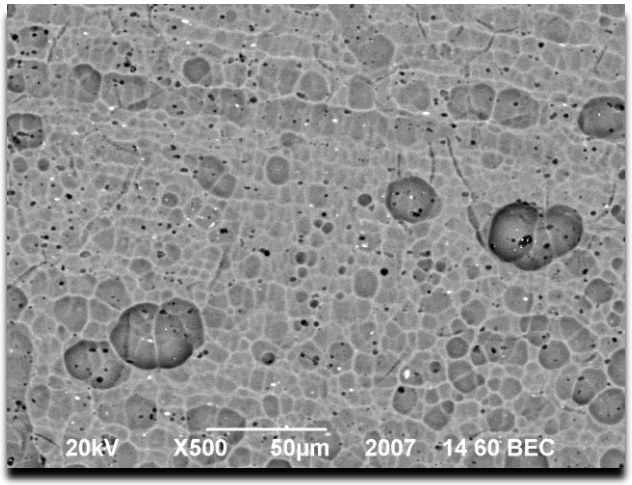
Pickling

Necessary properties of a surface of metal

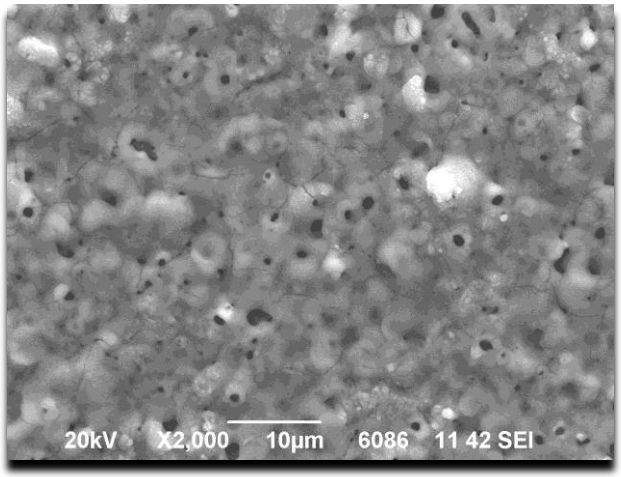
The technology must to have:

- Advanced relief of surface and with flat borders of phases
- Minimum thickness of protective layer
- High force of adhesion of oxide layer with surface
- High wettability of surface

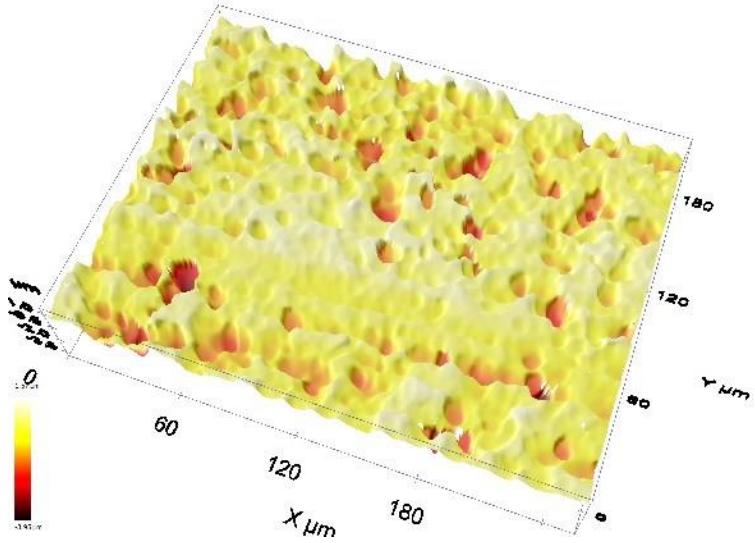
Surface of aluminum alloy “V-1469”



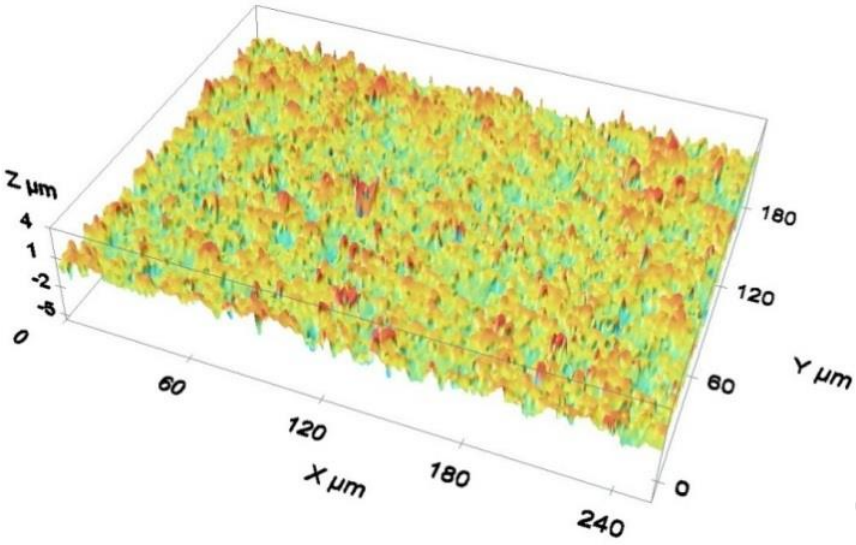
new solution



PEO



new solution

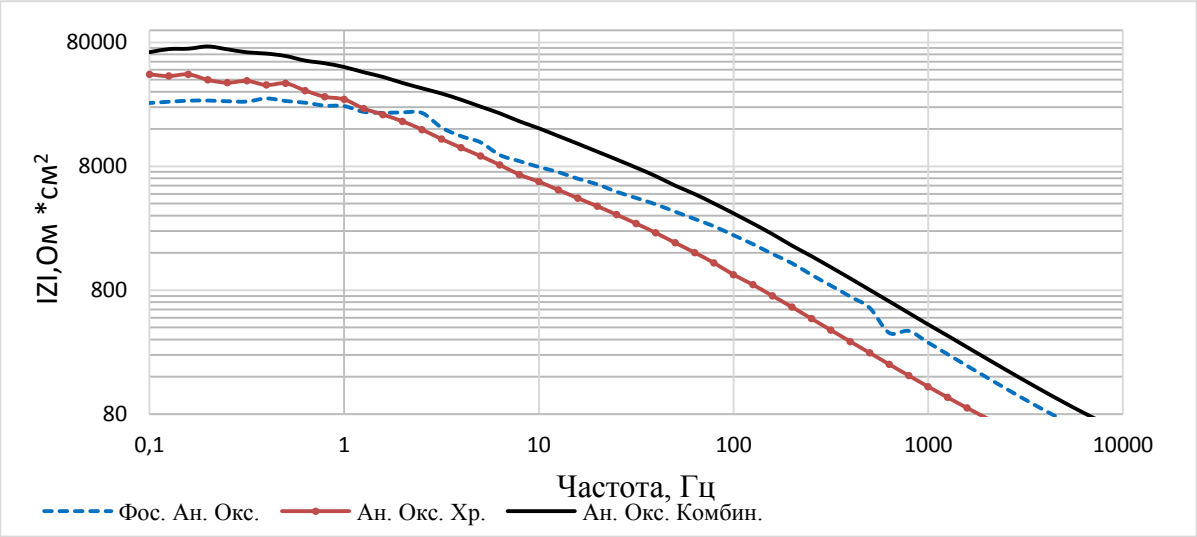


PEO

Pasting durability. Binder “ВСК-14-2М”. Alloy “V-1469”

Solution	Thickness, micron	Durability at shift, MPa		wettability, hail
		indicator	Nature of destruction (к - kogesion, a – adhesion)	
new solution	2	$\frac{35,0}{34,6-35,5}$	77%К 23%А	≤ 15
PEO	4,5	$\frac{25,2}{24,7-26,5}$	30%К 70%А	≤ 15

Electrochemical properties



The chart Baud for samples with coverings.

Solution	$R_{эл}$, Ом·см^2	CPE_1,		R_1, Ом·см$^{-2}$	CPE_2,		R_2, Ом·см^2	$\|Z\|_{f = 0,1 Гц}$, Ом·см$^{-2}$
		Y_o, См·см$^{-2}$·с^n	n		Y_o, См·см$^{-2}$·с^n	n		
Phosphoric anodizing	35	$1,19*10^{-6}$	0,92	5953	$2,97*10^{-6}$	0,96	17752	25 941
Chromium anodizing	35	$2,2*10^{-6}$	0,94	5723	$4,47*10^{-6}$	0,86	32317	44 114
new solution	35	$1,14*10^{-6}$	0,87	20739	$3,23*10^{-6}$	0,78	46286	66 656

Researches of protective properties

before statement

after 432 hours

Solution	The exposure time to the first appearance of corrosion centers, hour
Phosphoric anodizing	168
Chromium anodizing	336
New solution	432
Sulfuric acid anodizing	720

FEDERAL STATE UNITARY ENTERPRISEALL-RUSSIAN SCIENTIFIC RESEARCH INSTITUTE OF AVIATION MATERIALSSTATE RESEARCH CENTER OF THE RUSSIAN FEDERATION

17, Radio Street, Moscow

Tel: +7(499)261-86-77

Fax: +7(499)267-86-09

E-mail: admin@viam.ru