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Inert anodes sysnthesis research for aluminium industry

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Inert anodes usage in aluminium industry causes to electric energy savings by decreasing ohmic loss on the anode, and decreasing interpolation distance (anode-cathode); saving carbon material. This is allows to completely exclude CO_2 emissions, sulphuric compounds, carbon fluorides, benzopyrhens outgoing.

The inert anodes research was made by Metallurgy and Material Science Institute Russian Academy of Science, these anodes were made by different synthesizes from various materials: metallic alloys, press-sintering, and plasma spraying produced cermets. Best results were achieved at Ni-Fe-Al-Me (where Me is Re, Mn or Si an others) based alloy usage, with previous metal surface preparing by oxide layer forming, that resistant to cryolite alumina melt. Good stability during the electrolysis was noticed for these alloys, revert electromotive force was about 2.2－2.3 V, geometric dimensions of the specimens has not changed, also observed a gas outgoing.

Capsulated gradient composite material synthesis is a new technical solution for inert anode production. This material consists of multilayer non porous composition with barrier layers. Layers are increasing endurance to atomic oxygen influence and electrochemical corrosion during the electrolysis. Several types of anodes (differs by production technology and working layer consistent) were investigated. The best specimens are homogeneous and gradient metal-ceramic anodes with various metallic and oxide phase concentration. It shows high enough endurance: a significant corrosion was not observed during 72 hours electrolysis.

Positive results about some gradient and metallic inert anodes synthesis and testing allows enlarge laboratory testing to industrial scale.

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