Yeldana

NAZARBAYEV UNIVERSITY

NAZARBAYEV UNIVERSITY NATIONAL LABORATORY ASTANA

Institute of Batteries

INESS

The 5th International Conference on Nanomaterials and Advanced Energy Storage Systems

ABSTRACT BOOK

PEOPLE

MARIE CURIE ACTIONS

WaSClean

The 4th Workshop on Water and Soil Clean-up from Mixed Contaminants

Energy storage

Advanced Nanomaterials

Alternative advanced energy

Catalysis and fuel cells

Modeling tools

Environment protection

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Regularities of Charge Transfer in Magnesium Corrosion Films

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Magnesium and its alloys have a high negative electrode potentialand a low electrochemical equivalent, which allows magnesium, along with lithium, to be used as an anode material in chemical sources of current. However, one of the major problems arising with the use of magnesium is its relatively high corrosion rate, both under natural conditions and under conditions of anodic polarization

When magnesium is corroded, passive films of various types are formed on its surface, depending on the nature of the electrolyte. The formation of corrosive films can be caused both by purely chemical causes (corrosion) and by passivation under current when insoluble compounds can form on the surface. According to available data, corrosion films are not homogeneous. Therefore, when considering the electrochemical processes in the magnesium-electrolyte system, it is necessary to take into account the fact of the presence of corrosion products on the metal surface. Since the transfer of charge in this case will be determined by the presence of a corrosion film, an analysis of the polarization curves was carried out for the presence of assumed regularities in them. Convinced on numerous examples that charge transfer in magnesium corrosion films is not described in its pure form by any of the basic laws, it was suggested that the elements of an equivalent film scheme can be characterized by the different mechanisms of the charge transfer. Approximations of polarization curves were conducted on equivalent schemes with successive and parallel connection of elements that were before used for description of charge transfer through lithium films. It was determined that none of the schemes for which the analysis was performed, characterizes completely the charge transfer in magnesium films.

It was found that almost all polarization curves consist of 3 sections. The first section is described by the law of charge transfer in fields of high intensity (exponential dependence). The second section is rectilinear and refers to the voltage drop in the film as the current passes through it (Ohm's law). The third section characterizes the activation processes that take place on the surface of the electrode.