

The contemporary civilisation has faced the necessity to solve some problems essential for its further development in the world scale. One of the most important issues is depletion of mineral fuels resources. Moreover, it should be mentioned that both exploration of energy resources, and production of energy applying conventional methods cause systematic pollution of the environment. Further civilisation advance makes it necessary to solve the problem of providing the world with ecologically produced energy. Also, world trends suggest maintenance of a decreasing tendency of consumption of primary, non-renewable energy sources resulting from their limiting amount. They will be replaced and supplanted by renewable energy sources.

One of the proposal aiming at a complex solution of the world energy problem is production of hydrogen with the use of renewable energy sources. Due to its properties, hydrogen is considered as a very promising energy carrier that could replace currently applied fuels. It results mainly from its high energy density falling per a mass unit (140 MJ/kg). However, the essential condition for replacing the current energy carriers with hydrogen is elaboration of inexpensive, effective and fast methods of hydrogen production that would base on renewable energy sources. Such an example is obtaining hydrogen with the use of the electrolysis method where energy will come mostly from the sun and wind.

Electrolysis of water is the simplest way of industrial obtaining of high purity hydrogen and oxygen. It is an easy process, relatively inexpensive to conduct and can take place both in acid and alkaline environments. The key significance is attributed to the type of materials used as electrodes in such a process. The highest catalytic activity in the process of obtaining hydrogen through water decomposition is typical for platinum-group metals. However, their high prices and limited resources hinder their common application. It creates a need to search for new materials with properties allowing to replace platinum metals. Catalytic properties of cobalt, molybdenum and tungsten are known and the metals are used as additives to alloys characterised by low overpotential for the reaction of hydrogen evolution. Recently, it has been observed that chalcogenides of transition metals also feature similar properties. On the basis of the above literature reports it can be deduced that combining Co with Mo or W with addition of sulphur or selenium can result in obtaining alloys of much better catalytic properties in relation to presently applied two-component materials using the above mentioned elements.

Concluding, the scientific aim of the present project is to determine an influence of addition of chalcogens on catalytic properties of Co-W and Co-Mo alloys. The examinations will include optimization of the electrochemical process parameters of depositing alloy coatings of Co-Mo and Co-W with addition of sulphur and selenium as alloy additives. The examined electrode process proceeding on newly synthesized materials will be evolution of hydrogen from aqueous solutions. An analysis of the electrochemical process of alloys deposition on the base of transition metals with sulphur and selenium is very interesting from the point of view of possibilities to obtain materials of such type. Taking into consideration many existing techniques used to obtain alloy coatings, the motive for applying the electrochemical method is the fact that it is one of the cheapest technologies used for their production. The summary effect will be determination of a possibility to obtain Co-Mo and Co-W alloys with sulphur or selenium with the electrochemical method, as well as an analysis of the mechanism and kinetics of electrode reactions taking place during their deposition. An additional final effect can be elaboration of a one-level process of deposition of the above listed alloys with the electrochemical method from aqueous solution and determination of their catalytic properties.