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"Gheorghe Asachi" Technical University of Iasi, Romania

NOVEL MATERIALS AND REACTORS FOR THE EFFICIENT ELECTROCHEMICAL PRODUCTION OF HYDROGEN

Gheorghe Duca[1], Victor Covaliov[2], Olga Covaliova[1*]

[1]Institute of Chemistry, 3 Academiei Str., Chisinau, MD 2028, Republic of Moldova
[2]Moldova State University, Institute of Research and Innovation, 60 Mateevici Str., Chisinau, MD 2009, Republic of Moldova

Abstract

Hydrogen is one of the most promising energy bearers for future. Its electroc--hemical production offers a possibility to obtain 99.0-99.5% and higher purity hydrogen. This paper describes the energy-efficient process of hydrogen production using the three-dimensional electrodes, based on the carbonaceous materials and foamy metals covered with double (Ni-Re) and triple (Ni-B-W, Ni-B-Re) alloys. Modification of the porous electrode surface with mentioned alloys makes it possible to obtain a highly reactive external and internal electrode surface and thus, substantially reduce the overvoltage of hydrogen gas generation, which tends to the value of hydrogen emission on platinum. Utilization of the proposed electrodes leads to the efficient generation of hydrogen using the electrochemical reactors with modified designs. Another serious problem of electrochemical hydrogen production is simultaneous oxygen evolution on the anode surface during the electrolysis, as mixing of these two gases beyond the certain limits may provoke the formation of explosive mixtures. To overcome this challenge, making the gas evolving process safe, and collect precious oxygen gas separately, a new magnetic hydro-dynamic method has been proposed to ensure the oxygen-hydrogen mixture separation.

Keywords: electrochemical reactor, gas mixture separation, hydrogen, 3D electrodes

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[*] Author to whom all correspondence should be addressed: e-mail: covaleva.olga@yahoo.com; Phone: +373 79155319; Fax: +373 739954