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Electrical properties of nanostructured systems FeSe-CuInSe2 and MnSe-CuInSe2 under conditions of varying moisture and lighting

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At the present time, the problem of renewable energy sources is relevant due to the depletion of traditional energy resources. In this aspect, a lot of work has been done in the field of developing converters into an electric form of solar energy. New devices are being developed, which are based on new physical principles. In particular, encouraging results have been obtained in the field of adsorption electric power engineering. In particular, the devices capable of converting the chemical energy of adsorption of atmospheric moisture molecules into an electrical form were developed [1-3]. The relevant scientific and technological task is the development of power plants capable of producing electrical energy from some renewable sources (hybrid) in particular, sunlight energy and moisture adsorption energy. This function can be performed by nanoporous photoadsorbers as FeSe-CuInSe2 and MnSe-CuInSe2 - systems. Such structural organization (2d in 3d) allows obtaining electricity through two physical channels: photogeneration (3d properties) and chemoconversion (2d properties). The studying of the electrical properties of nanostructured crystals FeSe-CuInSe2 and MnSe-CuInSe2 at direct current is a relevant and was a purpose of this work.
Crystals of two compositions were used as the studied objects: 10mol% MnSe-90mol%CuInSe2 and 5mol%FuSe-95mol%CuInSe2 obtained using chemical technology. Voltammograms (V-I) were obtained in the linear scan mode by the R-20 device (”Elinns”) in the moisture saturation mode at three points (75, 35 and 26% ± 5%). The sample chamber was a closed 350 ml container with controlled atmospheric humidity using MgCl2×6H2O (35%) and NaCl (75%) salts.
A significant dependence of the electrical parameters on humidity on the illumination of the samples was established. A new size effect of an abrupt change a current at a voltage of the order of 2V has been established (commution [4]). The effect can be interpreted from the standpoint of synergetics.
It is assumed that the observed features of the behavior of the studied systems in humidification and lighting conditions are due to the bimodal structure of the sample. Large single crystals are effective photo adsorbers, and nanopores are physicochemical proton reactors. It was found that an increase in humidity over 35% leads to the appearance of nonlinear sections of the V-I. The established effects can find application in advanced energy engineering and nanoelectronics.

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