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Branko Matović
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Vladimir V. Srdić

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FORMATION OF MgO/Mg(OH)$_2$ NANOSTRUCTURES BY MOLTEN SALT ELECTROLYSIS

V.S. Cvetković[1], N.M. Vukićević[1], N.D. Nikolić[1], G. Branković[2], Z. Baščarević[2], T.S. Barudžija[3], J.N. Jovićević[1]

[1]*ICTM, University of Belgrade, Njegoševa 12, Belgrade, Serbia*
[2]*Institute for Multidisciplinary Research, University of Belgrade, Serbia*
[3]*Vinča Institute of Nuclear Science, University of Belgrade, Serbia*

Thanking its unique characteristics, magnesium oxide and magnesium hydroxide nanostructures are of high practical significance for possible application in the next generation of solar cells, electronic devices, displays, in detection and adsorption of different environmental pollutants [1]. Numerous methods of synthesis including precipitation, solvothermal and hydrothermal processes, the sono-chemical technique, the sol-gel method, microwave methods, chemical vapor deposition, carbonatization and electrochemical method are widely used for synthesis of various forms magnesium oxide/magnesium hydroxide nanostructures such as whiskers, platelets, rods, needle-like, flower like etc. Electrochemical method attracts a special attention in a production of nanostructures owing to easy control of morphology of particles by the choice of regimes and parameters of electrolysis.

In this study, the processes of electrolysis from magnesium nitrate hexahydrate melt in the both potentiostatic and galvanostatic conditions were analyzed. Morphologies of synthesized particles were characterized by scanning electron microscopy (SEM) technique. The X-ray diffraction (XRD) analysis of produced particles showed that the mixture of magnesium oxide and magnesium hydroxide was formed by these molten salt electrolysis processes [2,3].

No any difference in surface morphology was observed between these two constant regimes of electrolysis. The very thin needles often grouped in flower-like aggregates were obtained by the electrolysis processes. The special attention was devoted to the effect of hydrogen as parallel reaction to processes of electrolysis. In the dependence of parameters of electrolysis (potential or current density applied), holes formed from detached hydrogen bubbles of various shape and size from dish-like holes to those creating the honeycomb-like structures were formed. Mechanism of formation of all observed morphological forms was considered. Also, comparison with electrolysis processes from aqueous magnesium salt electrolytes was made and discussed.

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