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Metal Oxide Nanoparticles: Synthesis in Hydrocarbon Flames and Their Applications in Solar Cells

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This paper presents the results of investigation the synthesis of metal oxide nanoparticles in hydrocarbon flames and their application for improving the efficiency of solar cells.

Metal oxide nanoparticles have synthesized on the nichrome wires in thickness of 3 mm in the diffusion counter-flow propane-oxygen (φ=1) flame. The X-ray spectroscopy shows the component of the nichrome wire: nickel (70 %), iron (21 %) and chrome (8.72 %). The investigation of the influence processing time of the wire in flame show that with increase processing time of the wire in flame rising the size of metal oxide nanoparticles. The flame treatment of the wire in during the 5 seconds led to synthesis of metal oxides nanoparticles with size of 70 nm. The flame treatment of the wire in during the 5 and 10 minutes led to synthesis of chrome (III) oxide (Cr_2O_3) and metal oxides (NiO, Ni_2O_3, Cr_2O_3 Fe_2O_3, and FeO) nanoparticles with size of 300 and 700 nm, respectively.

It was studied the influence the synthesized metal oxides nanoparticles with different size to increasing the efficiency of solar cells. The result of investigation show that coating the surface of the silicon solar cell with size of nanoparticles of metal oxide 300 nm led to increase the output load voltage up to 4-7%, short-circuit current up to 20-28%, which in the aggregate resulted in increased efficiency of solar cells by 2-3%.

It has proposed the theoretical analysis of the mechanism of the influence of metal oxide nanoparticles to increase the efficiency of the solar cell.

Biography:

Professor Zulkhair Mansurov is a General Director of the Institute of Combustion Problems of the Ministry of Education and Science of the Republic of Kazakhstan. Zulkhair Mansurov successfully defended PhD and Doctor of Sciences dissertations in 1973 and 1990, correspondingly. In 1981 Zulkhair Mansurov got 10-months scientific probation at the University College of London, Great Britain. Professor Mansurov's scientific activity includes study and investigations of kinetics and mechanisms of hydrocarbon combustion and structure of cool soothing flames: catalytic carbon formation and its applied aspects. In 2002 group of scientists headed by Professor Mansurov has received Diploma for discovery of "Phenomenon of low-temperature cool-flame soot formation", issued by the Russian Academy of Natural Sciences, Russian Federation, International Academy of the Inventors Association. Professor Zulkair Mansurov's professional career includes longstanding activity in INTAS Council of Scientists. He is a Editor-in-Chief of "Combustion and Plasmochemistry Journal" and "Eurasian Chemico-Technological Journal" issuing in English, indexed at Scopus.