ФИЗИКА ПЛАЗМЫ И ЭЛЕКТРОФИЗИКА

HYDROTHERMAL METHOD OF BINARY $CoMoO_4/CuMoO_4$ NANOCOMPOSITES AS AN ELECTRODE FOR HIGH-PERFORMANCE SUPERCAPACITOR APPLICATION

S. Viji[1], B. Kabilan[2], A. Dinesh[3], S. Sakthivel[2], V. Jeevitha[2], Manikandan Ayyar[2,4], V. Mohanavel[5], P. Jothilakshmi[6], G. Ramachandran[1], M. Santhamoorthy[7], Y. Slimani[8], M. A. Almessiere[8,9], A. Baykal[10,11], S. Santhoshkumar[12]

[1] Department of Chemistry, Dr. Ambedkar Govt. Arts College (Autonomous), affiliated to the University of Madras), Vyasarpadi, Chennai – 600 039, Tamil Nadu, India; e-mail: puppyviji82@gmail.com.

[2] Department of Chemistry, Centre for Material Chemistry, Karpagam Academy of Higher Education, Coimbatore – 641021, Tamil Nadu, India.

[3] Department of Chemistry, K. Ramakrishnan College of Engineering (Autonomous), Samayapuram, Trichy – 621 112, Tamil Nadu, India.

[4] Centre for Material Chemistry, Karpagam Academy of Higher Education, Coimbatore – 641021, Tamil Nadu, India.

[5] Centre for Sustainable Materials Research, Department of Mechanical Engineering, Academy of Maritime Education and Training (AMET), Deemed to be University, Kanathur, Chennai 603112, Tamil Nadu, India.

[6] Department of Electronics and Communication Engineering, Amrita School of Engineering, Amrita Vishwa Vidyapeetham, Chennai, Tamil Nadu, India.

[7] School of Chemical Engineering, Yeungnam University, Gyeongsan, 38541, Republic of Korea.

[8] Department of Biophysics, Institute for Research and Medical Consultations (IRMC), Imam Abdulrahman Bin Faisal University, P.O. Box 1982, Dammam, 31441, Saudi Arabia.

[9] Department of Physics, College of Science, Imam Abdulrahman Bin Faisal University, P.O. Box 1982, Dammam, 31441, Saudi Arabia.

[10] Food Engineering Department, Faculty of Engineering, Istanbul Aydin University, Florya, Istanbul 34295, Turkey.

[11] Basic Pharmacy Department, Pharmacy Faculty, Istanbul Aydin University, Istanbul 34295, Turkey.

[12] Department of Biochemistry, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.

Metal molybdate nanocomposites have recently drawn scientific interest for supercapacitor devices, because of their benefits, including good redox reactions and low synthesis costs. This work successfully produced $CoMoO_4/CuMoO_4$ nanocomposites (CCMO NCs) grown on nickel foam using a single-pot hydrothermal approach. Furthermore, X-ray diffraction (XRD) confirms that CCMO NCs are well crystalline structure...

Keywords: hydrothermal, energy density, nanorods, supercapacitors.

1. Introduction. Demand for efficient and affordable energy storage technology has increased significantly in recent years due to increased energy efficiency and reduced greenhouse gas emissions [1, 2]. Supercapacitor-type chemical energy storage devices have focused more on attributes like rapid discharge and charge, environmental friendliness, high power density, and non-toxicity. There are several transition metal oxides that can increase energy density more effectively. Transition metal oxides (TMOs), particularly RuO_2, $NiCo_2O_4$, Mn_2O_4, and $NiMoO_4$, have been thoroughly investigated for battery and supercapacitor applications [3–7]. Their advantages include quick energy transfer, extended cycle stability and high specific power [8–10]. Transition metal oxide has become a suitable material for supercapacitor electrodes due to its inexpensive manufacturing procedure, high theoretical capacitance and availability [11]. Large surface areas and high faradic capacitance are characteristics of the metal oxide nanomaterials made using the template method [12]. The $CoMoO_4$ has recently drawn increasing attention for electrochemical energy storage due to its large theoretical capacity, natural availability, and environmental friendliness. However, the limited electrochemically active sites and fundamentally slow reaction kinetics of $CoMoO_4$-based systems make their electrochemical characteristics unacceptable and need to be adequately addressed [13]. The $CuMoO_4$ nanocatalyst has garnered much attention lately due to its preferred uses as a catalyst in proton conductivity, ion exchange, photochemistry and intercalation chemistry. Furthermore, researchers have grown nanomaterials with distinctive forms, like nanotubes, nanowires, and nanosheets on porous conductive substrates [14–16]...

Поступила в редакцию 26 апреля 2025 г.

После доработки 24 июля 2025 г.

Принята к публикации 30 июля 2025 г.