



ABSTRACT BOOK

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Using solar energy by a smart window for the needs of urban residents

Guzal Ismailova¹, Leonid Mikhailov¹, Svetlana Mikhailova^{1*}, Raiymbek Yersayin¹, Nursultan Kenes¹, Oleg Lavrishev¹, Valery Nikulin¹

¹ IETP, al-Farabi Kazakh National University, 71 al-Farabi avn. 050040 Almaty, Kazakhstan

*E-mail: guzal_a81@mail.ru

**E-mail: svetik.mikhailova@gmail.com

Development of a smart device containing solar panels, carrying out both energy and dust collection, decorative and productive gardening, regulation of light, heat and sound flow into the room is described.

The aim of this development is to increase consumer attractiveness for individuals and profitability of the device using solar panels in urban conditions. Relevance of the study is also related to global sustainable development goals [1], namely: Goal 11 - aimed at improving the ecology of cities, Goal 7 - promoting the use of clean energy, and Goal 13 - measures to handle with climate change.

The device has a modular design principle to simplify installation and operation. The device consists of a main bearing module on which one can place 1-4 movable solar panels with a nominal power 125 W, a protective and dust collecting dielectric plate, a block with vegetation, a washing and sprinkler unit and an automation unit that are connected to the overall electrical and mechanical circuit of the device powered by solar panels and the battery.

One of the features of the developing device is simple use and mounting on the building window, presence of a movable plate that protects the front surface of the solar panel from contamination and picks up dust. The solar panel with the plate obscures the light and noise flow into the room, creates a heated and illuminated greenhouse for plants on the windowsill, thereby prolonging the photosynthetic activity of plants for the winter period and increasing the amount of absorbed greenhouse gases. The device control system, essentially: a smart-window, runs on the basis of Arduino (C++) using arbitrary logic (scripts) for various events in and out of the room.

Currently, a working model reduced at a scale of 1:5 of the developing device has been manufactured, and a full-size model of the device has been made on the window of the Faculty of Physics and Technology.

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References

- [1] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development (2015) p. 35

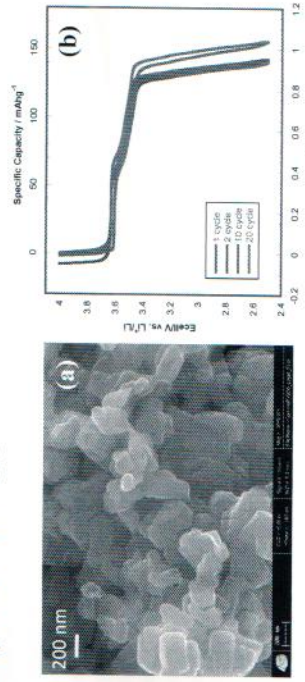
Nanosized puckered V_2O_5 γ - γ' -polymorph as cathode material for Li-ion batteries with enhanced electrochemical properties

Dauren Batyrbekuly^{1,2*}, Barbara Latk¹, Nicolas Emery¹, Zhumabay Bakenov², Jean-Pierre Pereira-Ramos¹, Rita Baddour-Hadjean¹

¹ Institut de Chimie et des Matériaux Paris Est, GEMMAT, UMR 7182 CNRS-Université Paris Est Créteil, 2 rue Henri Dunant, 94320 Thiais, France

² Institute of Batteries LLC, Nazarbayev University, 53 Kabanbay Batyr Avenue, Astana 010000, Kazakhstan
*E-mail: dauren.batyrbekuly@nu.edu.kz

The layered α - V_2O_5 compound with Van der Waals interlayer spacing is considered as a model for Li insertion reactions and has been extensively investigated as cathode material for Li batteries in various voltage windows [1]. We gave recently evidence for the interest of the puckered layer γ - V_2O_5 polymorph allowing reversible Li insertion at a higher potential (+0.2 V) compared to α - V_2O_5 [2]. In the present work, we have investigated the electrochemical behaviour of γ - V_2O_5 in the high voltage window (4 V-2.5 V) corresponding to the exchange of 1 Li⁺/mole of oxide (147 mAh g⁻¹). Cycling properties, rate capability and kinetic parameters for Li insertion in γ - V_2O_5 are reported here for the first time in the 4.0 V-2.5 V potential range. Nanosized oxide particles were prepared from a solution technique leading to a very fine powder with porous morphology (figure a). A stable capacity of 140 mAh/g over 50 cycles at C/5 is obtained (figure b) while a remarkable value of 110 mAh/g is still achieved at 10 C. All the data are discussed at the light of the structural mechanism recently evidenced for γ - V_2O_5 . A promoting nanosize effect is demonstrated on the electrochemical performance of γ - V_2O_5 .



(a) SEM image and (b) cycling properties (C/5 rate) of γ - V_2O_5

Reference

- [1] M.S. Whittingham, Chem Rev. 104 (2004) 4271-4301
[2] R. Baddour-Hadjean, M. Safrany Remard, J.P. Pereira-Ramos, Acta Mater. 165 (2019) 183-191