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Remote-Controlled Temperature Setup Designed for ZnO Nanostructures Fabrication

Cătălin CRECIUNEL*, Vladimir CIOBANU, Eduard V. MONAICO

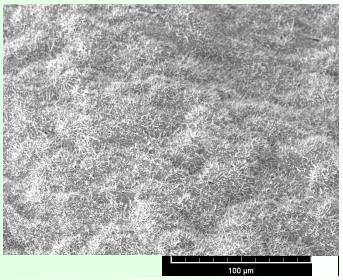
National Center for Materials Study and Testing, Technical University of Moldova, Bd. Stefan cel Mare 168, Chisinau, MD-2004, Republic of Moldova

*Corresponding author: creciunel.catalin@mib.utm.md

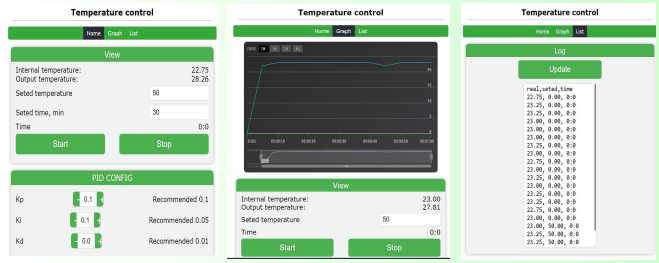
BACKGROUND

The primary objective of this study was to obtain ZnO and Gold enriched ZnO nanostructures through thermal treatment (TT) of zinc foils. Initially, the surface of zinc foils were covered with 13 nm layer of gold with the aim to enhance the properties of the resulting material. The deposition of the Au layer was performed using a Cressington 108 setup under vacuum conditions of 0.05 bar, with a current of 40 mA for 30 seconds to achieve the desired thickness of 13 nm. The thermal treatment of Zn foils was conducted using a specially designed temperature setup reported in this work. As a result, not only ZnO has been successfully synthesized, but we also obtained Au-functionalized ZnO, which may offer additional beneficial properties for various applications.

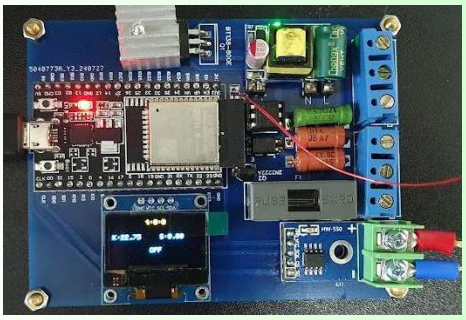
SEM IMAGES OF THE ZnO NANOSTRUCTURES OBTAINED BY TT OF ZINC FOIL



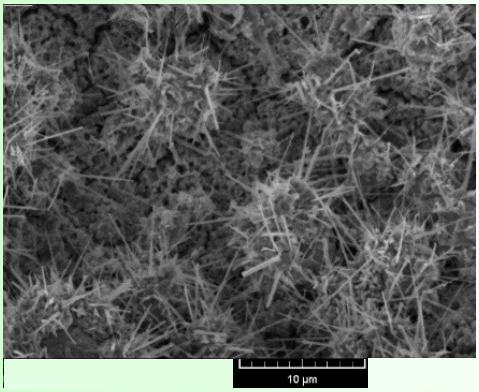
GRAPHICAL INTERFACE OF THE DEVICE

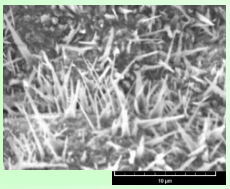


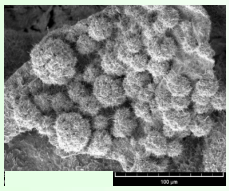
THE ELABORATED DEVICE



SEM IMAGES OF Au DECORATED ZnO NANOSTRUCTURES







Conclusions

The developed device is a low-cost and universal solution, which including FreeRTOS on the ESP32 platform allows to obtain ZnO [1] as well as Au-functionalized ZnO nanostructures. Due to the alternating signal routing, it allows the connection of any network heater with a current limit of 8 A, making it suitable for a wide range of heat reactors. The device connects to the Wi-Fi network, allowing users to set slope, temperature via PID constants and run time, while providing a real-time graphical representation of the data. In addition, data is displayed in tabular format for further processing and research purposes. This combination of affordability and advanced technology makes it an attractive option for various applications [2,3].

Acknowledgments

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References

[1] C. Creciunel, Controlul inteligent a temperaturii de la distanță elaborat pentru tratamentul termic al foliilor de zinc. In: Proceedings of the Conferința tehnico-științifică a studenților, masteranzilor și doctoranzilor; Technical University of Moldova: Chisinau, Moldova, April 5 2023; Vol. 1, pp. 274–278.
[2] C. Creciunel, Obținerea și studiul straturilor de oxid de zinc prin corodarea electrochimică a foliilor de zinc. In Proceedings of the Conferința tehnico-științifică a studenților, masteranzilor și doctoranzilor; Technical University of Moldova: Chisinau, Moldova, April 5 2023; Vol. 1, pp. 279–283.
[3] E.V. Monaico, I. Tiginyanu, V. Ursaki, Porous Semiconductor Compounds. Semicond. Sci. Technol. 2020, 35, 103001, doi:10.1088/1361-6641/ab9477.