SSNN 17P EFFECT OF RAPID THERMAL ANNEALING IN FURNACE OF NANOCRYSTALLITE $Cu_{1-x}Zn_xO_y$ FILMS ON HYDROGEN GAS RESPONSE

V. Creţu[1,*]
[1]*Department of Microelectronics and Biomedical Engineering, Technical University of Moldova, Chisinau, Republic of Moldova*
*E-mail: vasilii.cretu@yahoo.com

Hydrogen (H_2) is expected to be "the fuel of the future" and can be used in the future power devices, H_2 engine cars, solid oxide fuel cells [1]. But hydrogen gas forms explosive mixtures with air if it is 4–74% concentrated and with chlorine if it is 5–95% concentrated. Thus, it is necessary to detect hydrogen leakage in the environment. In this work, nanocrystallite $Cu_{1-x}Zn_xO_y$ films were synthesized from chemical solution (SCS) of copper sulfate, zinc sulfate, sodium thiosulfate and rapid thermal annealed (RTA) in furnace at different temperatures and durations. Morphological and structural studies were performed in our previous work [2]. Samples were exposed to 100 ppm H_2, CH_4, and ethanol. Thickness of deposited layers was 0.95 μm.

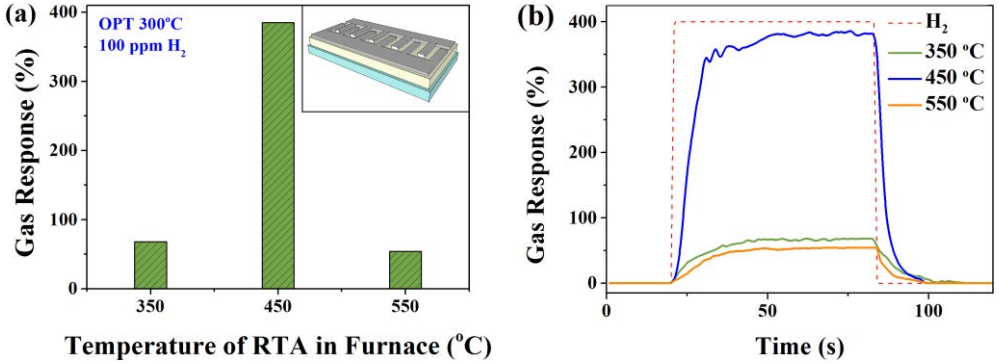

Figure 1. (a) Gas response to 100 ppm H_2 versus temperature of RTA in furnace (for 60 s) of nanocrystallite $Cu_{1-x}Zn_xO_y$ films. (b) Dynamic gas response to 100 ppm H_2 of sensors based on RTA treated nanocrystallite $Cu_{1-x}Zn_xO_y$ films.

Figure 1 (a) shows gas response to 100 ppm H_2 versus temperature of RTA in furnace (for 60 s) of nanocrystallite $Cu_{1-x}Zn_xO_y$ films (3wt%Zn) synthesized by SCS method. Can be observed that highest gas response to 100 ppm H_2 gas is for samples RTA treated at 450 °C for 60 s. The operating temperature of sensors was 300 °C. There has been no response to ethanol and CH_4 gases at this operating temperature. In inset in Figure 1 (a) presents a 3D configuration of developed sensor structures that consist from glass substrate, sensing layer and meander-shaped contacts pads.

Figure 1 (b) shows dynamic gas response of sensors based on RTA treated nanocrystallite $Cu_{1-x}Zn_xO_y$ films (3wt%Zn). The fastest response time (τ_r = 7.8 s) and recovery time (τ_f = 6.1 s) was recorded for sensors treated at 450 °C. For lower temperatures of RTA treatment (350 °C) τ_r and τ_f are increased about 3 times. In case of higher temperatures of treatment (550 °C) was detected an increased response time (about 2 times). Developed technique allows designing new hydrogen sensors based on nanocrystallite depositions of $Cu_{1-x}Zn_xO_y$.

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