PROPERTIES OF NANOCRYSTALLITE $Cu_{1-X}Zn_XO$ FILMS GROWN BY CHEMICAL DEPOSITION FOR BIOSENSORS AND ANTIMICROBIAL APPLICATIONS

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Nanocrystallite metal oxide films have attracted great attention for their applications in chemical sensors [1], biosensors [2] and for antimicrobial applications [3]. In this context, copper oxide it is well known as effective photocatalytic material and investigated for inactivation of bacteria [2-3]. In this work, nanocrystallite $Cu_{1-x}Zn_xO$ films were grown by chemical deposition from aqueous solution of copper sulphate, zinc sulphate, sodium thiosulphate. We found that post-growth processing parameters, such as heating rate, annealing temperature and ambient, were crucial to form nanocrystallite $Cu_{1-x}Zn_xO$ films. Rapid thermal annealing in air at 650 °C with fast temperature ramp rate resulted in formation of tenorite phase of the deposition. High-magnification SEM studies showed in Figure 1(inset) that layers are formed from nanocrystallites of single crystal nanomaterial.

XRD method was used to analyze the atomic structure of the crystalline material. The XRD diffractograms (Figure 1) were collected by θ–2θ mode to find the information from the inside of nanocrystallite materials. The phase identification of the $Cu_{1-x}Zn_xO$ layers was analyzed by X-ray diffraction and found that the structure of cupric oxide is monoclinic and tetramolecular cell with following parameters: a=4.6837 Å, b=3.4226 Å, c=5.1288 Å, β=99.54°. The space group C_{2h}^6-C2/c has been ascribed to the structure of the tenorite. The as-deposited layers possess cuprite structure according to PDF card 050667.

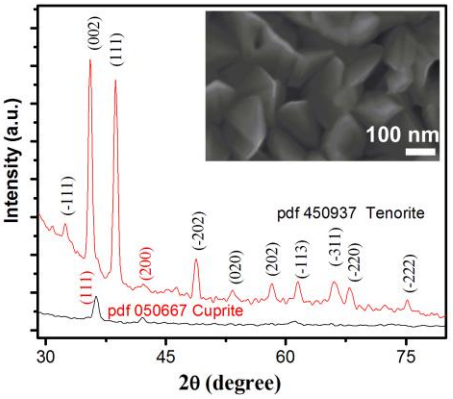

Figure 1. XRD and inset SEM of nanocrystallite films.

Current density versus potential was measured in absence and presence of the glucose in alkaline electrolyte at +0.5 V and observed possibility to be used as sensor. The sensitivity was about 560 $\mu A.cm^{-2}mM^{-1}$. Such performances may be attributed to the large scale surface area and improved electron transfer in the nanocrystallite $Cu_{1-x}Zn_xO$ layers. Further investigations are under progress based on preliminary promising results.

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