

DR-7. CHEMICAL BATH DEPOSITION OF Cu_2S THIN FILMS FROM THIOSULPHATE SOLUTIONS

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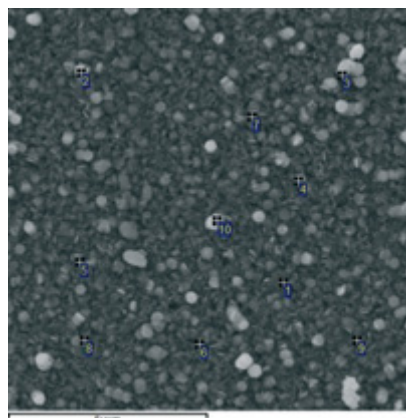
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Among metal chalcogenides copper (I) sulfide films have been extensively synthesized due to their potential applications as *p*-type semiconductors. Cu_2S has been successfully used as gas sensor for the detection of ammonia gas at room temperature [1] and photocatalyst for the degradation of organic dyes [2]. Thus, developing an effective method to synthesize Cu_2S materials is of current interest.

Chemical bath deposition (CBD) is an inexpensive and simple route for synthesis of thin solid films. In our present research polycrystalline Cu_2S films with thickness of 200 nm have been successfully synthesized from thiosulfate solutions using CBD. Some critical parameters have been established which are necessary to control phase composition, because chemical reaction can be induced by different parameters, namely, reaction temperature, sulfidizer, concentration of precursors, time of deposition, complexing agent and pH of the solution.

№	Elements, at.%			
	S	Cl	Cu	Cu/S
1	31,35	5,76	62,88	2,006
2	30,47	5,91	63,62	2,088
3	31,18	6,38	62,44	2,002
4	31,55	6,16	62,29	1,974
5	31,36	5,40	63,24	2,016
6	31,97	5,98	62,06	1,941
7	32,47	5,84	61,68	1,899
8	30,28	4,81	64,91	2,143
9	31,93	5,30	62,77	1,965
10	31,77	5,55	62,69	1,994
Average	31,43	5,71	62,86	2,0



SEM image and EDX analysis of Cu_2S film synthesized at 343 K from chemical bath containing $[\text{CuCl}_2] = 0,05 \text{ M}$, $[\text{Na}_2\text{S}_2\text{O}_3] = 0,05 \text{ M}$, $[\text{C}_4\text{H}_6\text{O}_6] = 0,1 \text{ M}$, $[\text{NH}_2\text{OH} \cdot \text{HCl}] = 0,05 \text{ M}$

The mirror polycrystalline Cu_2S films possessed well adhesion to glass-ceramic substrates. Dark brown color of films correlated with the narrow bandgap of Cu_2S . The results of the EDX analysis revealed the high stoichiometry of Cu_2S layers. The average content of copper and sulfur was established to be $62,86 \pm 1,25$ and $31,43 \pm 1,25 \text{ at.}\%$, correspondingly. Chlorine presence ($5,71 \text{ at.}\%$) in Cu_2S films was supposed to be due to chemical nature of precursors (CuCl_2 , $\text{NH}_2\text{OH} \cdot \text{HCl}$).

References

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2. Marigold-like Cu_x ($x = 1.81, 2$)S nanocrystals: Controllable synthesis, field emission, and photocatalytic properties / C. Song [et al.] // Appl. Phys. A Mater. Sci. Process. Springer, Berlin, Heidelberg. 2014. Vol. 115, № 3. P. 801.

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