PR-8. CHEMICAL BATH DEPOSITION OF In_2S_3 THIN FILMS AS A PROMISING MATERIAL AND BUFFER LAYER FOR SOLAR CELLS

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The indium(III) sulphide has found wide application in opto- and microelectronics, solar energy such as a material possessing to some unique properties. Simultaneously indium (III) sulphide is a basis for thin film chalcopyrite structures – promising materials for solar cells [1]. Copper(I) and indium (III) disulfide $Cu_2S–In_2S_3$ is the first one among each similar semiconductors that involves indium (III) sulphide. There are different deposition methods of solar materials in the $Cu_2S–In_2S_3$ system such as for the In_2S_3 [2]. However the main formation condition for solid solution is deposition possibility of individual metal sulphide thin films.

Indium (III) sulphide thin films are deposited on sital substrates in this experimental work that were fixed in holders and immersed in reactors with a mixture [3]. Synthesis was carried out from the aqua solution that consisted of $In(NO_3)_3$, CH_3CSNH_2, $C_4H_6C_6$ and $NH_2OH \cdot HCl$ additions in temperature interval 343–368 K. The thickness of the deposited films is limited from 290 to 760 nm. The XRD researches of the deposited In_2S_3 thin films have shown, that they crystallized in cubic structure. It is noticed that lines with least *hkl* indexes on XRD pattern of thin film are absent because of the strong substrate background is presence, and also the accurate crystal structure is not formed completely.

Scanning electron microscopy defined that indium (III) sulphide in powder type consists of spherical aggregates with diameter from 0,3 to 5,5 μm, formed by flat crystallites (near 30 nm). Films are formed from fibriform (40–70 nm). EDX microanalysis defined that powder In_2S_3 is less concentrated by oxygen (5,9 at.%), than films (8,0 at.%), which is connected with larger sizes of powder agglomerates. The X-ray photoelectron spectroscopy indicates that the deposited layers were strongly charged and have high ohmic resistance. The typical sulfur S2*p* level spectrum, which also has two components. The nature of the low-energy component (about 161,4 eV) is ambiguous because it is relatively far away from the S2*p* level with a binding energy of 162,2 eV (this value is inherent to indium three-sulphide). The In3*d* shell indicates that indium is in one energy state. The energy of the detectable In3*d* level is close to the theoretical value corresponding to indium sulphide (III). This enables us to infer that the obtained compound is indium sulphide with a contaminated and oxidized surface.

References

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