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# INFLUENCE OF TECHNOLOGICAL PARAMETERS ON PROPERTIES OF INDIUM SULFIDE THIN FILMS DEPOSITED BY CHEMICAL SPRAY PYROLYSIS

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In the last decades indium sulfide ($In_2S_3$) thin films have been a topic of interest of research groups due to its use in photovoltaic devices [1, 2].

In our laboratory, a nanostructured solar cell, including $In_2S_3$ as a buffer layer, has been made by chemical spray pyrolysis (CSP) using pneumatic spray set-up [3]. In order to prepare an effective solar cell it is important to know the properties of each layer in the solar cell structure.

In this study $In_2S_3$ thin films were deposited by CSP method. Precursor solution containing $InCl_3$ and $SC(NH_2)_2$ at molar ratio In/S = 1/3 and 1/6 was deposited onto preheated glass sheets at substrate temperatures from 205 up to 410 °C. The obtained films were characterized by XRD, SEM, optical transmission spectra and XPS. According to XRD, thin films deposited at $T_s$=205 - 365 °C are composed of the (0 0 12) orientated tetragonal β-$In_2S_3$ independent of the In/S in spray solution. Deposition at $T_s$ = 410°C leads to the formation of $In_2O_3$, preferably when the 1/3 solution was sprayed. $In_2S_3$ films, grown at $T_s$ < 365 °C, exhibit transparency over 70 % in visible spectral region and Eg of 2.15-2.30 eV for indirect transitions. Film thickness and chlorine content were decreasing by increasing the deposition temperature. XPS study reveals that In/S in spray solution has significant influence on content of oxygen (Me-O, BE = 530.0 eV) in $In_2S_3$ films. Oxygen content in the films deposited from the In/S = 1/6 solutions is below 1 at. % ($T_s$ = 205 - 365 °C), which is substantially less than in the films from the 1/3 solutions (4.6 at. % in the film prepared at $T_s$= 365 °C).

References

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