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PII: S0925-8388(18)33028-7

DOI: 10.1016/j.jallcom.2018.08.157

Reference: JALCOM 47245

To appear in: *Journal of Alloys and Compounds*

Received Date: 1 June 2018

Revised Date: 31 July 2018

Accepted Date: 16 August 2018

Please cite this article as: W. Feng, J. Song, Y. Ren, F. Chen, J. Hu, S. Yu, H. Zhao, Y. Tang, S. Huang, Structural and optical evolution in $Pb_{100-x}Ag_xSe$ (x☐=☐3, 6, 9 and 12) thin films by chemical bath deposition, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.08.157.

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Structural and optical evolution in $Pb_{100-x}Ag_xSe$ (x=3, 6, 9 and 12) thin films by chemical bath deposition

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Abstract

We developed a simple room-temperature synthetic route that achieves well-crystallized $Pb_{100-x}Ag_xSe$ alloy thin films by chemical bath deposition (CBD). The strategy provides a new paradigm to synthesize Ag doped PbSe thin films in one-step. We show that uniform distributed $Pb_{100-x}Ag_xSe$ thin films can be produced, whose crystal structure, morphology, and optical properties could be tailored with Ag concentration. With increasing x, both the shape and size of crystals are changing. Besides, the growth mechanism transits from cluster to ion by ion (IBI). The optical band gap (E_g) of the thin films is found to linearly increase with x values, from 0.26 eV to 0.31 eV. The density of states (DOS) and energy band structure of $Pb_{100-x}Ag_xSe$ are calculated using the first principle method. The calculation shows that Se 4p

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