Chemical Sciences Journal

Min, Chem Sci J 2016, 7:2
DOI: 10.4172/2150-3494.1000e113

Editorial Open Access

Characterization of *N*-Type and *P*-Type Thin Films

Ho Soon Min*

INTI International University, Putra Nilai, 71800, Negeri Sembilan, Malaysia

Polycrystalline thin films have been prepared by using several deposition techniques as reported by many researchers [1-10]. Researchers claim that each of the deposition method has its own benefit and disadvantage as well. For instance, chemical bath deposition, electro deposition method, chemical spray pyrolysis and SILAR are some examples of solution based deposition method with many advantages including simple apparatus setup, less monitoring required, economical, large area deposition possible and require less amount of starting precursors. However, some researchers point out some disadvantages such as require a potentiostat, reference electrode and counter electrode in electro deposition method. They also comment that non-uniformity of films, low deposition rate, and low ratio of atoms effectively deposited to those supplied by using chemical spray pyrolysis method. Lastly, they found that there are various experimental parameters have to be optimized in order to prepare good quality films using chemical bath deposition technique. On the other hand, evaporation and sputtering are some examples of physical vapor deposition method. Thin films with smooth surface could be obtained using the evaporation method. Other advantages such as very thin layer could be produced and very low amount of powder needed. However, the disadvantages of this deposition method includes it requires thermal evaporation apparatus, it needs proper ventilation, and large area deposition difficult. As described by many researchers, sputter deposition technique involves ejecting precursors from a target onto substrate. Some benefits such as the obtained films have a composition quite close to that of the source material and precursors with very high melting points are easily sputtered as mentioned. However, disadvantages of this process including active control for layer by layer growth is very hard, more difficult to combine with a lift off for structuring the films, the gas composition must be controlled in order to prevent poisoning, sputtering targets are expensive, and lastly sputtering rates are low if compared to other deposition method.

In recent years, interest in the electrical properties of thin films has considerably increased. There are several techniques have been applied to measure the electrical conductivity of the thin films including thermoelectric power measurement, Hall effect experiment, four point measurement and hot probe experiment. Generally, *n*-type semiconductors such as lead selenide, manganese sulphide, copper indium disulphide, cadmium selenide, copper indium diselenide, zinc sulphide, cadmium sulphide and bismuth telluride thin films have a larger electron concentration than hole concentration. In contrast, zinc selenide, tin selenide, tin sulphide, lead sulphide, copper zinc tin sulfide, cadmium zinc telluride, copper aluminium sulphide, nickel sulphide, copper indium ditelluride and zinc telluride thin films are examples of *p*-type semiconductors and they have a larger hole concentration than electron concentration. Researchers always explain that the *p*-type and *n*-type are refer to the positive charge of the hole and negative charge of the electron, respectively. The obtained *n*-type and *p*-type semiconductors could be used in many electrical devices such as semiconductor diode, transistors, lasers, photovoltaic cells, photodetectors and field effect transistors. For example, photovoltaic cells consist of *p*-*n* junction tools in order to create electrical energy from sunlight. In this situation, the energy of the photon that leads to electrons to be promoted into the conduction bands and eventually carries the current.

References

1. Anuar K, Saravanan N, Ho SM, Noraini K (2010) XRD and AFM studies of ZnS thin films produced by electrodeposition method. Arabian Journal of Chemistry 3: 243-249.
2. Henry J, Mohanraj K, Sivakumar G (2016) Electrical and optical properties of CZTS thin films prepared by SILAR method. Journal of Asian Ceramic Societies 4: 81-84.
3. Anuar K, Ho SM (2010) Deposition and characterization of MnS thin films by chemical bath deposition method. International Journal of Chemistry Research 1: 1-5.
4. Benyahia K, Benhaya A, Aida MS (2015) ZnS thin films deposition by thermal evaporation for photovoltaic applications. Journal of Semiconductors, p: 36.
5. Anuar K, Ho SM, Lim KS, Saravanan N (2011) SEM, EDAX and UV-Visible studies on the properties of Cu_2S thin films. Chalcogenide Letters 8: 405-410.
6. Subhash C, Dhaka MS (2015) Preparation and physical characterization of CdTe thin films deposited by vacuum evaporation for photovoltaic applications. Advanced Materials Letters.
7. Anuar K, Tan WT, Saravanan N, Khor LK, Ho SM (2010) Effects of deposition time on the chemical bath-deposited CuS thin films. Journal of Nepal Chemical Society 25: 2-8.
8. Park JP, Kim SK, Park J, Ok KM, Shim I (2009) Deposition of $CuInSe_2$ thin films using stable cooper and indium selenide precursors through two stage MOCVD method. Bulletin of the Korean Chemical Society 30: 853-856.
9. Anuar K, Tan WT, Jelas M, Ho SM, Gwee SY (2010) Effects of deposition period on the properties of FeS_2 thin films by chemical bath deposition method. Thammasat International Journal of Science and Technology 15: 62-69.
10. Ho SM (2014) Influence of complexing agent on the growth of chemically deposited $Ni_3Pb_2S_2$ thin films. Oriental Journal of Chemistry 30: 1009-1012.

***Corresponding author:** Ho Soon Min, INTI International University, Putra Nilai, 71800, Negeri Sembilan, Malaysia, E-mail: soonmin.ho@newinti.edu.my

Received April 20, 2016; **Accepted** April 21, 2016; **Published** April 26, 2016

Citation: Min HS (2016) Characterization of *N*-Type and *P*-Type Thin Films. Chem Sci J 7: e113. doi:10.4172/2150-3494.1000e113