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A novel method for low temperature crystallization of transparent conducting delafossite $AgInO_2$

Keerthi K[a], Aijo John K[a], B. Pradeep[b], Benoy M. D[c], Anuroop R [b] and Rachel Reena Philip [a]*.

[a]*Thin Film Research Lab, U.C.College, Aluva, Kerala, India,*

[b]*Solid State Physics Laboratory,Cochin University of Science and Technology,Kochi 682022, Kerala, India*

[c]*Department of Physics, Mar Athanasius college, Kothamangalam, Kerala, India.*

*Corresponding author: email reenatara@rediffmail.com,
Phone: +91 484 2605072, Fax: +91 484 2607534.

Abstract

By a two stage process involving vacuum evaporation and post annealing in air, deposition of crystalline delafossite silver indium oxide (AIO) thin films at a substrate temperature ~573K is achieved. This is the lowest temperature of crystallisation so far reported for delafossite AIO films. The metallic silver indium to semiconducting silver indium oxide transition is monitored by studying the structural, electrical, transport and optical properties of the films that are annealed at six different temperatures from 303 K to 623 K. A comparative study of the AIO thin films prepared by air annealing and by oxygen- plasma- enhanced reactive evaporation in vacuum is done to correlate the properties of crystalline and amorphous films obtained by the two different methods. The crystalline n-type transparent conducting silver indium oxide thin films show a preferred orientation along (101) plane and manifest better electrical conductivity and photosensitivity than the amorphous AIO.

Keywords

Transparent conducting oxides, Delafossite silver indium oxide, Electrical conductivity, optical properties.

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