Research Article

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Study of solvent effect on structural and photoconductive behavior of ternary chalcogenides InBiS3-In2S3-Bi2S3 composite thin films deposited via AACVD

Supplementary material

Experimental

Synthesis of [Bi(S2CN(C2H5)2)2]2 (1)

In a classical experiment, 1.16 g (6.17 mmol) of potassium dithiocarbamate was taken in 20 mL acetone in a round bottom flask (fitted with a reflux condenser, a dropping funnel and inert gas line) and stirred. To this solution, 1.00 g (2.06 mmol) Bi(NO3)3·5H2O was added that gave yellow coloured solution and was further stirred for one hour, filtered and kept for crystallization. After two days yellow coloured crystals of Bi complex were obtained. Yield: (82%). M.p: 199°C. CHNS analysis Calc. for C17H23BiN2S3: C, 27.55%; H, 4.60%; N, 6.44%; S, 29.39%; Found C, 27.42%; H, 4.59%; N, 6.45%; S, 28.89%. IR (νmax/cm−1) 2970w, 2936w, 1490s, 1432s, 1374w, 1351s, 1266s, 1198s, 1139s, 1063s, 989w, 910w, 835w, 765s, 690s (Figure S2).

Synthesis of [In(S2CN(C2H5)2)2]·2py (2)

The same procedure was adopted for the synthesis of precursor 2 as used for precursor 1. The quantities of reagents used were: Sodium dicyclohexyl dithiocarbamate (0.50 g, 1.80 mmoles) and indium trichloride (0.19 g, 0.86 mmol). Yield (79%), m.p. 254-259°C (decomposition). Elemental analysis found: C, 56.72; H, 7.84; N, 6.33%; S, 18.55%; C24H31InN2S2 requires: C, 56.46; H, 7.34; N 6.71%; S, 18.45%. IR (νmax/cm−1): 2930m, 2850w, 1578w, 1470s, 1435m, 1376s, 1346w, 1302m, 1240s, 1160s, 1107s, 1021s, 964m, 920s, 881s, 746s, 704w, 660m, 602m, 552w, 492s (Figure S3).

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Figure S1: Sticky pattern matching of IBS composite thin films.

Figure S2: FT-IR spectrum of synthesized precursor 1.

Figure S3: FT-IR spectrum of synthesized precursor 2.
Figure S4: Raman spectra of IBS thin films developed from precursors 1 and 2 at 500°C on FTO glass substrate by AACVD using toluene (green) and chloroform (red) as solvents in discrete experiments.

Figure S5: High magnified FESEM image of IBS composite thin films developed from toluene solvent indicating particle dimensions.

Figure S6: High magnified FESEM image of IBS composite thin films developed from chloroform solvent indicating particle dimensions.