# Deposition of Cobalt and Nickel Sulfide Thin Films from Thio- and Alkylthio-urea Complexes as Precursors *via* the Aerosol Assisted Chemical Vapour Deposition Technique

L.P. Mgabi, B.S. Dladla, M.A. Malik, S. S Garje, J. Akhtar, N. Revaprasadu

PII: S0040-6090(14)00507-0
DOI: doi: 10.1016/j.tsf.2014.04.086
Reference: TSF 33430

To appear in: *Thin Solid Films*

Received date: 18 June 2013
Revised date: 15 April 2014
Accepted date: 28 April 2014

Please cite this article as: L.P. Mgabi, B.S. Dladla, M.A. Malik, S. S Garje, J. Akhtar, N. Revaprasadu, Deposition of Cobalt and Nickel Sulfide Thin Films from Thio- and Alkylthio-urea Complexes as Precursors *via* the Aerosol Assisted Chemical Vapour Deposition Technique, *Thin Solid Films* (2014), doi: 10.1016/j.tsf.2014.04.086

# Deposition of Cobalt and Nickel Sulfide Thin Films from Thio- and Alkylthio-urea Complexes as Precursors *via* the Aerosol Assisted Chemical Vapour Deposition Technique

L. P. Mgabi,[a] B. S. Dladla,[a] M. A. Malik,[b] S. S Garje,[c] J. Akhtar[d], N. Revaprasadu*[a]

[a] Department of Chemistry, University of Zululand, Private bag X1001 KwaDlangezwa, 3880, South Africa.

[b] School of Chemistry, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK.

[c]Department of Chemistry, University of Mumbai, Vidyanagari, Santacruz (East), Mumbai -400 098, India.

[d] Nanoscience and Materials Synthesis Lab, Department of Physics, COMSATS, Institute of Information Technology (CIIT), Chak shahzad, Islamabad, Pakistan.

## Abstract

We report the synthesis of Co (II) and Ni (II) thiourea and alkylthiourea complexes by reacting the metal salts ($CoCl_2$ and $NiCl_2$) with the thiourea, phenylthiourea and dicyclohexylthiourea ligands in a 1:2 ratio. The complexes, $[CoCl_2(CS(NH_2)_2)_2]$ (**I**), $[CoCl_2(CSNHC_6H_5NH_2)_2$ (**II**) and $[CoCI_2(SC(NHC_6H_{11})_2)_2]$ (**III**), $[NiCl_2(CS(NH_2)_2)_2]$ (**IV**), $[NiCl_2(CSNHC_6H_5NH_2)_2]$ (**V**) and $[NiCl_2(SC(NHC_6H_{11})_2)_2]$ **(VI)** were characterized by C, H, N analysis and fourier transform infrared spectroscopy. Thermogravimetric analysis shows that all complexes undergo a two step decomposition process except for $[NiCl_2(CSNHC_6H_5NH_2)_2]$ (**V**) which decomposes in a single step. The complexes were used as single-source precursors for the deposition of cobalt sulfide and nickel sulfide thin films by aerosol assisted chemical vapor deposition at temperatures between 350 to 500 ºC. The crystallinity of the films was determined by X-ray diffraction and their morphology by scanning electron microscopy. The morphology of the cobalt sulfide thin films varies from randomly oriented platelets, to granulated spheres and cubes as the precursor and deposition