

This article may be downloaded for personal use only. Any other use requires prior permission of the author and AIP Publishing. This article appeared in Surf. Sci. Spectra 30, 014013 (2023) and may be found at <https://doi.org/10.1116/6.0002596>.

Indium acetate analyzed by XPS

Jhonatan Rodriguez-Pereira<sup>1,2</sup>, David Alejandro Miranda Mercado<sup>1</sup> and Rogelio Ospina<sup>1,a)</sup>

<sup>1</sup>Centro de Investigación Científica y Tecnológica en Materiales y Nanociencias (CMN), Universidad Industrial de Santander, Piedecuesta, Santander, P.C. 681011, Colombia.

<sup>2</sup>Center of Materials and Nanotechnologies, Faculty of Chemical Technology, University of Pardubice, Nam. Cs. Legii 565, 53002 Pardubice, Czech Republic.

## Abstract

Indium acetate was analyzed using x-ray photoelectron spectroscopy (XPS). The specimen is a powder purchased from Sigma Aldrich. The sample was fixed to a stainless-steel sample holder with copper 3MTM double-sided adhesive tape. Survey spectra, In 3d, O 1s, C 1s, In 3p, In MNN, and Cl 2p core levels spectra were acquired. Results showed how the elements in the structure of indium acetate are related.

Keywords: Indium acetate; XPS; precursor; acetic acid indium, indium salt

Accession#: 01834

Technique: XPS, XAES

Host Material: Indium acetate

Instrument: SPECS PHOIBOS 150

Major Elements in Spectra: In, O, C

Minor Elements in Spectra: Cl

Published Spectra: 7

Spectra in Electronic Record: 7

Spectral Category: comparison

## Introduction

Indium acetate is an inorganic compound with the chemical formula  $\text{In}(\text{CH}_3\text{COO})_3$ . It is a white crystalline solid that is soluble in water and organic solvents. Indium acetate is a chemical compound that is mainly used in the following applications. As a reagent in chemical synthesis, indium acetate is used as a catalyst or reagent in organic synthesis reactions. (Refs. 1 and 2). In the electronics industry, it is used as a precursor in the production of indium tin oxide (ITO) films, which are commonly used as transparent conductive coatings in electronic devices such as LCD displays and solar cells (Ref. 3). In glass industry, is used as a reagent in the production of special glass products, such as infrared-transmitting glasses and glass ceramics (Ref. 4). In the pharmaceutical industry, indium acetate has been explored as a potential pharmaceutical compound due to its ability to bind

to certain enzymes and proteins selectively; however, it is necessary to bear in mind that indium acetate is a hazardous substance and should be handled with care (Ref. 5).

#### SPECIMEN DESCRIPTION (ACCESSION # 01834)

Host Material: Indium acetate

CAS Registry #: 25114-58-3

Host Material Characteristics: homogeneous; solid; polycrystalline; unknown conductivity; inorganic compound; Powder

Chemical Name: Indium triacetate

Source: Sigma Aldrich

Host Composition: Indium (III) acetate (99.99%)

Form: Powder

Structure:  $\text{In}(\text{CH}_3\text{COO})_3$

History & Significance: Indium acetate powder was ground and fixed to a sample holder with copper 3MTM double-sided adhesive tape. The sample was stored in a reagent cabinet in our laboratory. Its manipulation was done using nitrile gloves and a stainless steel spatula. The sample was exposed to the environment for about 2 minutes, time that was spent to prepare the sample and then introduce it to the platform.

As Received Condition: As powder

Analyzed Region: same as the host material

Ex Situ Preparation/Mounting: As received.

In Situ Preparation: None

Charge Control: Electron flood gun (SPECS FG-500) operated at 70 nA and 4eV

Temp. During Analysis: 300 K

Pressure During Analysis:  $< 1 \times 10^{-7}$  Pa

Pre-analysis Beam Exposure: Not applicable s

#### INSTRUMENT DESCRIPTION

Manufacturer and Model: SPECS PHOIBOS 150 – 2D-DLD - SPECS Surface Nano Analysis GmbH

Analyzer Type: spherical sector

Detector: other

Number of Detector Elements: 25

#### INSTRUMENT PARAMETERS COMMON TO ALL SPECTRA

■Spectrometer

Analyzer Mode: constant pass energy

Throughput (T=EN): N=0

Excitation Source Window: Mylar window allows high X-ray transmission: 88% for Al K $\alpha$ .

Excitation Source: Al K $\alpha$  monochromatic

Source Energy: 1486.6 eV

Source Strength: 200 W

Source Beam Size: 2000  $\mu$ m x 2000  $\mu$ m

Signal Mode: multichannel direct

#### ■ Geometry

Incident Angle: 55 °

Source-to-Analyzer Angle: 55 °

Emission Angle: 0 °

Specimen Azimuthal Angle: Not applicable

Acceptance Angle from Analyzer Axis: 16 °

Analyzer Angular Acceptance Width: 16 ° x 16 °

#### ■ Ion Gun

Manufacturer and Model: SPECS IQE 12/38

Energy: 5000 eV

Current: 70 mA

Current Measurement Method: biased stage

Sputtering Species: Ar+

Spot Size (unrastered): 3000  $\mu$ m x 3000  $\mu$ m

Raster Size: Not applicable  $\mu$ m x  $\mu$ m

Incident Angle: 54°

Polar Angle: 55°

Azimuthal Angle: 45°

Comment: The specimen was analyzed as loaded. The ion gun was used only for cleaning the Ag reference foil.

#### DATA ANALYSIS METHOD

Energy Scale Correction: Binding energy of the adventitious carbon, C-(C, H) at 284.8 eV (Ref. 6), was used as reference to adjust the charge neutralizer potential.

Recommended Energy Scale Shift: 0 eV

Peak Shape and Background Method: Peak position and width were determined by fitting the spectra using a mixed Gaussian– Lorentzian, GL (30) function after subtraction of a Shirley background using the CasaXPS Software.

Quantitation Method: Peak areas were obtained by fitting the spectra and relative sensitivity factors from the atomic photoionization cross-section of each core level provided by the SPECS Prodigy library.

#### ACKNOWLEDGMENTS

The authors thank Laboratorio Central en Ciencia de Superficies (SurfLab-UIS) at the Universidad Industrial de Santander for providing their facilities to perform the XPS measurements. Furthermore, the authors thank the Universidad Industrial de Santander financial office for the support of J.R.P as a visiting Professor under the grant VIE.

#### AUTHOR DECLARATIONS

##### Conflicts of Interest (required)

The authors have no conflicts to disclose.

#### DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available within the article and its supplementary material.

#### REFERENCES

1. K. Miura, M. Tomita, J. Ichikawa and A. Hosomi, *Org. Lett.*, **10**, 133 (2008).
2. H. Gómez, A. Maldonado, R. Asomoza, E.P. Zironi, J. Cañetas-Ortega, and J. Palacios-Gómez, *Thin Solid Films*, **293**, 117 (1997).
3. G. Bianca, M.I. Zappia, S. Bellani, M. Ghini, N. Currelli, J. Buha, V. Galli, M. Prato, A. Soll, Z. Sofer, G. Lanzani, I Kriegel and F. Bonaccorso, *Adv. Mater. Interfaces*, **10**, 2201635 (2023).
4. I.R. Cisneros-Contreras, G. López-Ganem, O. Sánchez-Dena, Y.H. Wong, A.L. Pérez-Martínez and A. Rodríguez-Gómez, *physics*, **5**, 45 (2023).
5. K.H. Lee, H.L. Chen, C.M. Leung, H.P. Chen and P.C. Hsu, *Environ. Toxicol.*, **31**, 68 (2014).
6. P. G. Rouxhet and M. J. Genet, *Surf. Interface Anal.* **43**, 1453 (2011).