

Product Data Sheet

# Thermal Evaporation Materials

## Introduction

Thermal Evaporation Materials are used to deposit thin-film layers in the physical vapor deposition (PVD) process. An example of this is the production of CIG solar cells, where copper, indium, and gallium are co-deposited onto a substrate and processed along with selenium to form a photovoltaic device.

## General Properties of Common Evaporation Materials

Element Physical Properties					
	Indium	Gallium	Copper	Tin	Selenium
Atomic Number	49	31	29	50	34
Boiling Point	2072°C	2204°C	2562°C	2602°C	685°C
Melting Point	157°C	29.8°C	1084°C	231°C	221°C
Density	7.31g/cm <sup>3</sup>	6.10g/cm <sup>3</sup>	8.94g/cm <sup>3</sup>	6.99g/cm <sup>3</sup>	4.81g/cm <sup>3</sup>
Atomic Weight	114.8g/mol	69.7g/mol	63.5g/mol	118.7g/mol	79.0g/mol

Sample Physical Properties*				
	ITO	CIG	Cu-Ga	Cu-In
Melting Point	1500°C	1250°C	460°C	575°C
Density	7.16g/cm <sup>3</sup>	7.52g/cm <sup>3</sup>	7.91g/cm <sup>3</sup>	8.45g/cm <sup>3</sup>

\* Physical properties of one particular alloy composition

The chart above contains only a few of the most popular deposition materials we have to offer. Please visit [www.indium.com](http://www.indium.com) or email [Solar@Indium.com](mailto:Solar@Indium.com) for information about a material that is not shown here.

## Available Physical Forms

Below are some common shapes for some of the more popular evaporation materials we offer.

Material	Round Shot	Teardrop Shot	Chunks	Custom Forms	Crucible Filling	Custom Crucible Inserts
In	•	•		•	•	•
Cu	•			•		
ITO			•			
Ga	•				•	
Se	•					
In-Ga	•	•		•	•	

Our evaporation source materials are also available in custom shapes, sizes, and packaging options. Let our experienced team help you maximize the pack density of your boat or crucible.

## Crucible Filling

Indium Corporation offers two options to maximize your pack density.

- We can provide custom inserts to fit into your crucible.
- You can have your crucibles directly filled at Indium Corporation.

These solid crucible filling options offer the lowest surface area (lowest oxidation) and are convenient for application and inventory management.

## Technical Support

Indium Corporation's internationally experienced engineers, material scientists and metallurgists provide in-depth technical assistance to our customers. Thoroughly knowledgeable on all aspects of material science and metallurgy as it pertains to gallium metal, its uses and applications, our technical service staff is available to provide rapid response to all technical inquiries. We believe that our long-standing emphasis on providing our customers with superior technical service clearly differentiates Indium Corporation from our competitors.

## Material Safety Data Sheet

The MSDS for this product can be found online at <http://www.indium.com/techlibrary/msds.php>

This product data sheet is provided for general information only. It is not intended, and shall not be construed, to warrant or guarantee the performance of the

products described which are sold subject exclusively to written warranties and limitations thereon included in product packaging and invoices.

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