Physical Constants of Pure Indium

Structure

Face centered tetragonal at 25°C:
a = 0.32525 nm and c = 0.49465 nm

Mass Characteristics

Atomic weight: 114.82

Density:

°C	gm/cc
20	7.30
164	7.026
194	7.001
228	6.974
271	6.939
300	6.916

Volume change on freezing, 2.5% contraction

Thermal Properties

Melting point: 156.6°C
Boiling point: 2080°C
Coefficient of thermal expansion:
Linear, 24.8µm/m•K at 20°C

Specific heat:

°C	J/kg•K
25	233
127	252
156.63 (solid)	264
156.63 (liquid)	257
227	256
327	255
427	254

Latent heat of fusion: 28.47 kJ/kg
Latent heat of vaporization: 1959.42 kJ/kg
Thermal conductivity: 83.7 W/m•K at 0°C

Vapor pressure:

°C	kPa
1215	0.1013
1421	1.013
1693	10.13
2080	101.3

Electrical Properties

Electrical resistivity:

°C	nΩ-m
	3.38 K — Super conducting
20	84
154	291
181	301
222	319
280	348

Electrochemical equivalent: Valence 3, 396.4µg/C
Electrode potential: $In^0 \rightarrow In^{3+}$ + 3e, 0.38V
Electronegativity: 1.7 Pauling's

Magnetic Properties

Magnetic susceptibility, Volumetric: 7.0 x 10^{-6} mks

Nuclear Properties

Natural isotope distribution:

Mass Number	%
113•115	4.3
115	95.7

Thermal neutron cross section
For 2.2 km/s neutrons: absorption,190± 10b; scattering, 2.2± 0.5b
Valences shown: 3 also 2 and 1
Atomic radius/Goldschmidt: 0.157nm
Atomic number: 49
Photoelectric work function: 4.12eV
Electronic structure: $Kr4d^{10}5s^2 5p^1$
First ionization energy: 133k-cal/g-mole

Mechanical Properties

Tensile strength:

K	MPa
295	1.6
76	15.0
4	31.9

Compressive strength: 2.14 MPa
Hardness: 0.9HB
Elastic modulus at 20°C: 12.74 GPa in tension
Poisson's at 20°C: 0.4498
Bulk modulus: 35.3 GPa
Tensile modulus: 10.6 GPa

OVER→

Form No. 97532 R6

APPLICATION NOTE

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Physical Constants of Pure Indium

Typical Indium Applications

Indium, the 49th element, was discovered in Germany in 1863. In 1934, Indium Corporation of America was the first to begin commercial development of indium, and is still the leading refiner, fabricator, and marketer of this versatile silver-white metal.

Indium is used in a wide variety of applications, based on its unique attributes.

Soldering

When indium is included in solder compositions, many advantages are realized. Compared to conventional tin-lead solders, indium alloys exhibit lower crack propagation and improved resistance to thermal fatigue. Indium will reduce gold scavenging that can occur with tin-based solder on gold or gold-plated parts. Its ductility will allow some materials with different coefficients of thermal expansion to be joined together.

In spite of the metal's softness, it can strengthen materials it is alloyed with.

Bonding

The unique properties of indium make it an ideal bonding material, especially when bonding non-metals such as quartz, glass, and glazed ceramics. Indium can also be cold welded to itself. It easily deforms under pressure and will fill voids between two surfaces, even at cryogenic temperatures.

Low-Temperature Alloys

Indium is also the basis for many low melting point fusible alloys. These alloys are often used to hold products, such as eyeglass lenses or turbine blades, while the products are being worked on. Then the alloy can be removed with minimal heat, keeping the product from being damaged. Indium is also used with gallium to create alloys that are liquid at room temperature.

Thin Films

Thin films of indium-tin oxide (ITO) on clear glass or plastic function as transparent electrical conductors and/or infrared reflectors. Typical uses of thin films of ITO include LCD flat panel displays, touch screen CRT's, EL lamps and displays, EMI shields, solar panels and energy efficient windows. Aircraft and automobile windshields are coated with ITO for demisting and deicing. Other indium chemicals are used in alkaline batteries, replacing toxic mercury compounds.

High-Purity Indium

High-purity indium (99.9999 and 99.99999) is used in III-V compound semiconductors such as laser diodes.

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