



Indium (In⁴⁹)

Properties

Indium is a silvery-white metal with an atomic mass of 114.8. Indium has a density of 7.31 g/cm³, a melting point of 156 °C and a resistivity of 8.37 μOhm cm. It is the softest metal that is not considered to be an alkali metal with a Brinell hardness of 8.8 – 10.0 MPa. Indium has high antifriction properties with friction coefficient (dry) of 0.05 – 0.07 for steel.

Indium has the valences in compounds of +1 and +3. Its standard electrode potential in respect to In⁺¹ is -0.25V and In⁺³ is -0.34B. It is chemically resistant in ambient atmosphere, bases, cold mineral acids, except nitric acid. Indium makes up to 0.21 parts per million of the Earth's crust.

Plating Solutions

Indium electroplating can be performed in sulfate, sulfamate, tartrate, EDTA, fluoroborate and cyanide electrolytes, containing in g/l:

- a) Example #1. Indium sulfate – 50, sodium tartrate – 225, ammonium sulfate – 40, sodium chloride – 70 at pH 9.0 – 10.5 (adjusted with 25% ammonium solution), temperature of 18 – 25 °C and current density of 5 – 25 mA/cm² with current efficiency of 80 – 95%.
- b) Example #2. Indium fluoborate – 230, ammonium fluoborate – 45, boric acid – 25 at pH 2, temperature of 20 – 30 °C and current density of 50 – 100 mA/cm²

Indium can be also electroless plated using strong reducing agents such borohydride or DMAB, for example from the solution [1], containing in g/l: Indium sulfate – 4.76, EDTA – 6.43, triethanolamine – 3.73, sodium borohydrate – 1.89 at pH 8 – 9 and temperature of 60 – 80 °C.

Applications

Indium anti-friction coatings act as dry lubricants in some applications. Indium(III) oxide and indium tin oxide (ITO) are widely used as a transparent conductive coating on glass substrates in electroluminescent panels. Some indium compounds, such as indium antimonide and indium phosphide are semiconductors. InAs and InSb are used for low-temperature transistors and InP for high-temperature transistors. The compound semiconductors InGaN and InGaP are used in light-emitting diodes and laser diodes. Indium is used in photovoltaics as the semiconductor copper-indium-gallium-selenide (CIGS), so called CIGS solar cells. Indium is also used in PNP bipolar junction transistors with germanium.

References:

1. Wenjun Zheng and Liyan Wu. Journal of Materials Science Letters, 19, 1611 – 1613, 2000.

***CONTACT NANO3D SYSTEMS LLC TO FORMULATE INDIUM PLATING SOLUTION
PER YOUR REQUIREMENTS***