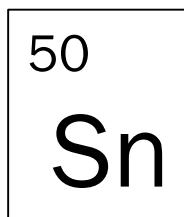


## About Tin

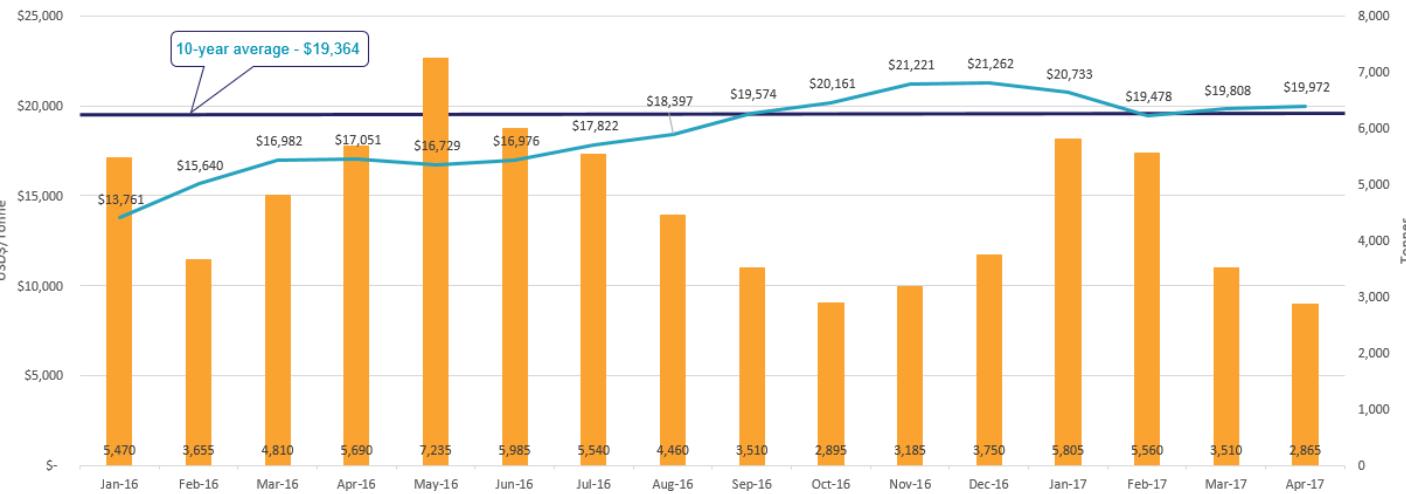
Tin is element number 50 on the periodic table. Its symbol is Sn, from the Latin: Stannum. Tin's inorganic compounds are non-toxic and it does not oxidize easily. Tin melts at a relatively low 232 °C.



Tin has been mined continuously for approximately 5,000 years. The discovery of tin and its subsequent combination with copper enabled the start of the Bronze Age. Bronze is principally copper, which is hardened by alloying it with tin and other metals. Early on, bronze was used for tools, weapons and jewellery. Predominantly tin alloys, like pewter, were used widely from the 15<sup>th</sup> century for tableware.

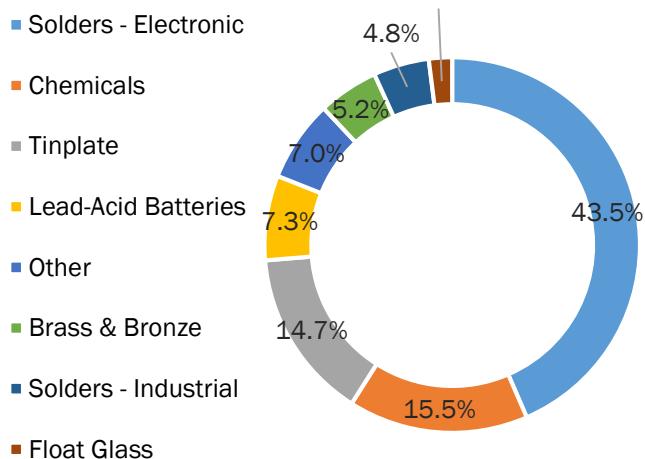
In the early 19<sup>th</sup> century modern electrochemistry made it possible to tin-plate other metals and commercial canning soon followed. Through the 20<sup>th</sup> century, tin was incorporated into a range of industrial and chemical processes. In 2006, the EU passed a law banning significant quantities of lead in consumer electronics produced in the EU. With many other countries pushing to reduce the use of lead-based materials, ~50% of the market for tin today is for use as solder. Tin may have potential in the next generation of advanced energy storage and generation technologies.

## Monthly Average Tin Price (LME Cash Buyer vs Stocks)



Source: LME

## Tin Uses



Source: ITRI

**346,000 tonnes of tin consumed globally in 2015**

**~50 % of tin is used for solder**

**Emerging applications in next-generation energy technologies**

## Tin Pricing

Tin is quoted on the London Metal Exchange ("LME") in US\$/tonne. The LME also provides stock movement figures which reflect the physical supply and demand in the market. Although there have been periods of volatility, the price of tin has risen steadily over the last 15 years from a low of approximately \$3,700 per tonne in February 2002, to approximately \$20,000 per tonne today. The 10-year average price for tin is in excess of \$19,000 per tonne.

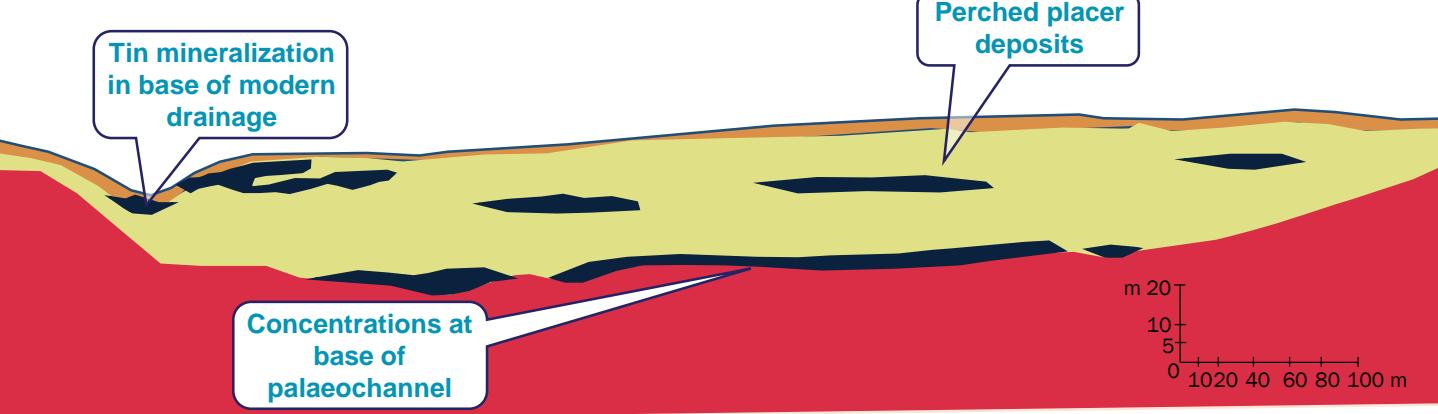
## Mining Tin

Tin is produced from the mineral cassiterite, which is tin oxide. Mining for tin is fairly straightforward. As a result, it has been mined for several millennia and a significant portion of the world's tin has been produced using simple artisanal methods. Traditional hard rock mining takes place in both underground and open pit mines. Ore is recovered through drilling and/or blasting and then is taken for concentration. Crushing and grinding the ore liberates the cassiterite, which, because it is quite dense, can be separated from the gangue (unwanted material) and concentrated using gravity-based methods, including shaking, jigging spiral and centrifugal concentration.

Using predominantly mechanical methods to produce tin concentrate means mining for tin is less harmful to the environment than mining for other commodities.

In alluvial mining, the ore-bearing rock has already been broken down through weathering or other forms of erosion. A palaeochannel, for example, is a rich and easily workable target that are formed when stream and river beds are covered by newer sediment (see diagram below).

Once the ore is concentrated it needs to be smelted to produce the desired metal and further reduce impurities.



## Tin Production Market Dynamics

Key tin-producing countries have historically included Australia, Bolivia, Brazil, China, Democratic Republic of Congo, Peru, and Indonesia. In recent years, production from a number of key producing countries has dropped. With the sustainability of long-term supply in question, other jurisdictions have moved to develop their tin assets, which has helped offset the shortfall. Tin recycling initiatives have also helped to reduce reliance on the identification of new tin resources. With approximately 50% of the tin market dedicated to solder, principally for use in the production of electronics, demand for tin is expected to grow steadily over the longer term.

## Tin Resources

London Metal Exchange - <https://lme.com/>

ITRI - <https://www.itri.co.uk/>

## Top 5 Tin Producing Countries

