

Facts about zircon

What is zircon?

Zircon, or zirconium silicate ($ZrSiO_4$), is a naturally-occurring mineral and the main source of zirconium metal and zirconium chemical derivatives. It is used in many everyday household products, as well as having significant industrial uses worldwide.

Zircon is found in ancient mineral sand deposits. In the form of crystal sands, zircon is typically brown, but could also vary from colourless to yellow-golden, pink and red to blue and green.

What are the main uses for zircon?

The unique properties of zircon mean that its uses are wide ranging. It is most commonly used in ceramics as an opacifying (whitening) agent for ceramic tiles, sanitaryware and tableware. Zircon is also used to produce decorative glass frits, glazes and pigments for ceramic decoration.

Other zircon-based products are used in many critical applications, including advanced ceramics, precision casting, electronic sensors, water treatment, corrosion resistant alloys, and in catalysts.

Specialist zirconia ceramics are used for electronics; such as in induction heaters, oxygen sensors and fuel cells, plus many other electronic components. These advanced materials are also biocompatible so are often used for medical implants.



Where is zircon sand produced and used?

The majority of zircon sand is mined in Australia and the African continent. Current annual global production is in excess of 1 million tonnes. Almost half of the zircon produced globally is consumed by China, with other significant consuming regions including Europe, North America, Asia-Pacific and India.

How is zircon transported?

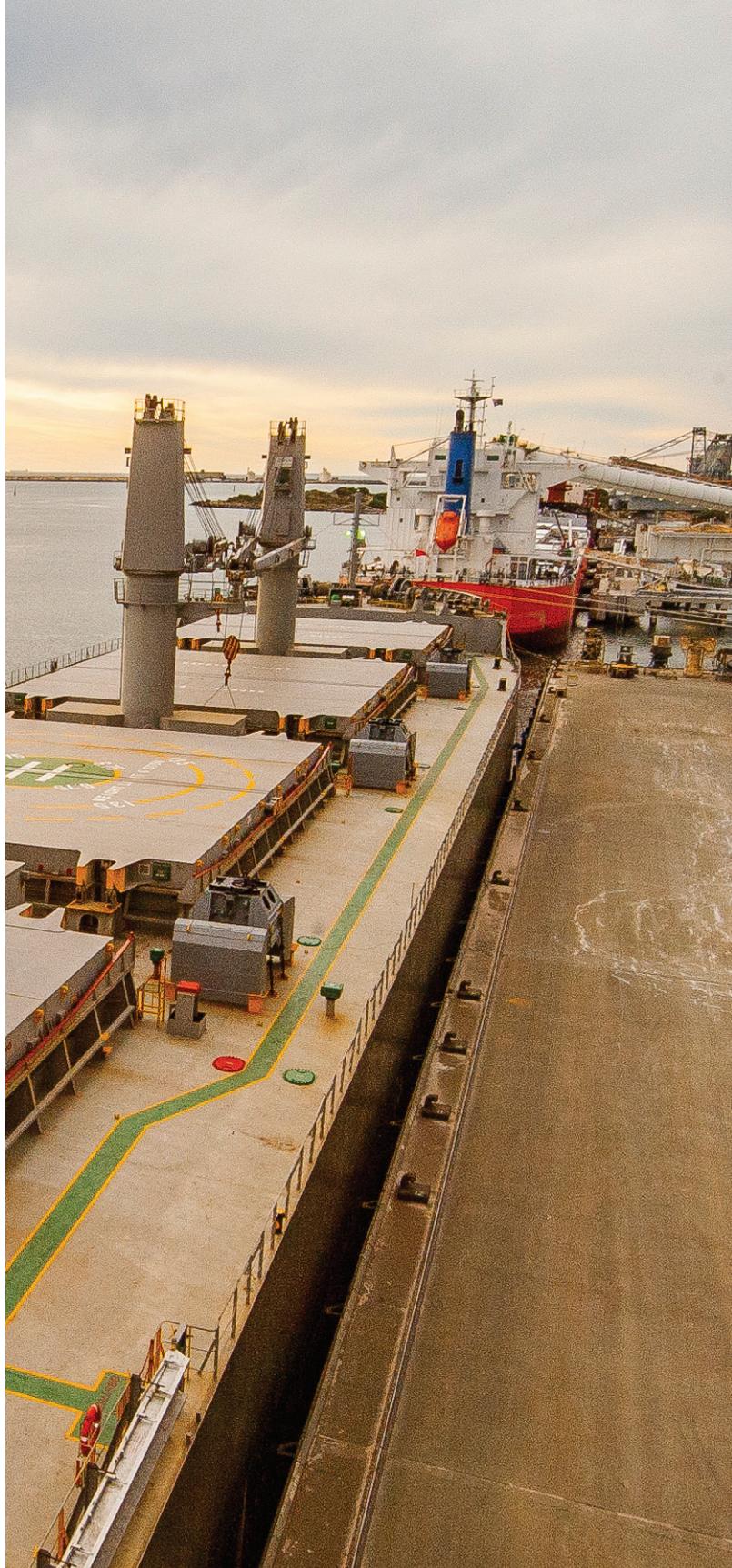
Most zircon sand is shipped in seagoing bulk carriers, unpackaged. A shipment is typically 1,000 mt, but may be as high as 10,000 mt. When transported by rail or road, zircon may be carried unpackaged in quantities of a few tens of tonnes per load, or may be packaged in palletized 1-2 mt bulk bags or 40 kg paper sacks. Palletized zircon is transported either as individual pallets or in shipping containers.

Zircon and radiation

Like many other natural minerals, zircon contains very small quantities of uranium (U) and thorium (Th) that cannot be removed without destroying the mineral's crystal structure. These U and Th radionuclei are found naturally in rocks, sands and soils around the world. The U and Th contents in zircon are generally lower than exemption levels for regulatory controls set by international and national authorities. Zircon can therefore be safely mined, handled and transported using basic safety measures.

Typical activity concentrations of U+Th in zircon sands are well below the 10 Bq/g transport exemption level for NORM and can therefore be shipped as general cargo (i.e. as non-radioactive material). In exceptional circumstances, some materials may exceed this level and are therefore required to be shipped as Class 7 Radioactive Material.

At receiving ports, every effort should be made to facilitate the movement of these essential zircon materials that have so many beneficial uses for our modern world.



Further reading

For further information about zircon and its applications visit www.zircon-association.org

For further details specifically on how to ship and transport zircon safely, read the ZIA zircon transport guide. <https://www.zircon-association.org/zia-publishes-zircon-transport-guide.html>

For information on the regulations to follow when transporting zircon please see the Regulation for the Safe Transport of Radioactive Material. https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1570_web.pdf

To discuss the transport of radioactive material with your country's regulatory authority, see the List of National Competent Authorities <http://www-ns.iaea.org/downloads/rw/radiation-safety/competent-authorities-list.pdf>

