ALKANE RESOURCES LTD

Mining the metals of the future

Niobium strengthens and lightens to reduce costs and CO_2 emissions

Infrastructure

Building stronger with less steel. The use of advanced high strength steels (AHSS) to build new, and replace old, infrastructure will play an important role in contributing to a low-carbon society.

Bridges

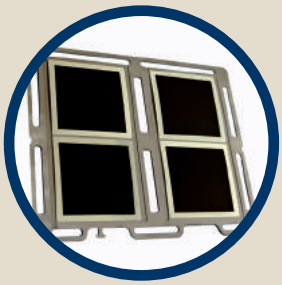
The ØRESUND bridge in Sweden used 0.022% of niobium in steel to reduce the weight of steel required by 15 tonnes and saved $25 million.

Power generators

Power stations rely on niobium stainless steel turbine blades to turn at extreme temperatures for power generation.

Pipelines

Water, gas, oil and chemical pipelines operate under very high pressure and at extreme temperatures. Niobium steels resist corrosion and require far less steel to operate safely.



Portable fuel cells

Solid oxide fuel cells deliver clean energy with high efficiency. Lightweight steels containing niobium are used to connect the fuel cells due to their electrical conductivity, corrosion resistance, mechanical strength at high temperatures and formability.

Transport

Niobium in steel decreases the amount of steel required, resulting in improved fuel efficiencies and decreased CO_2 emissions without compromising safety, style or affordability.

Aerospace

Niobium is used in jet engines and the newest generation of helicopters to reduce the weight of steel required, whilst maintaining their strength at extreme temperatures and pressures.

Freight trucks

A 25% weight reduction in the bucket of a truck using high strength steels resulted in 2.2% savings in total transportation costs, a reduction of 3.7% in diesel consumption and a 3% decrease in carbon dioxide emissions.

Automobiles

The auto industry is increasingly using niobium in steels to lighten cars. Just 300g of niobium reduces the weight of steel required in a mid-sized car by 200kg and improves the fuel efficiency by one litre per 200km driven, leading to lower emissions.

Maglev trains

Maglev trains currently travel up to 430kph along a magnetic guideway using niobium superconductor magnets.

Health & scientific advancement

Superconductor magnets can conduct electricity with no resistance at extremely low temperatures. They are used in advanced medical and scientific machines to improve human health and research understanding.

MRI

Magnetic Resonance Imaging is used to scan medical patients, to determine the severity of injuries. MRI machines contain superconductive magnets made from niobium-titanium alloys.

Advanced scientific research

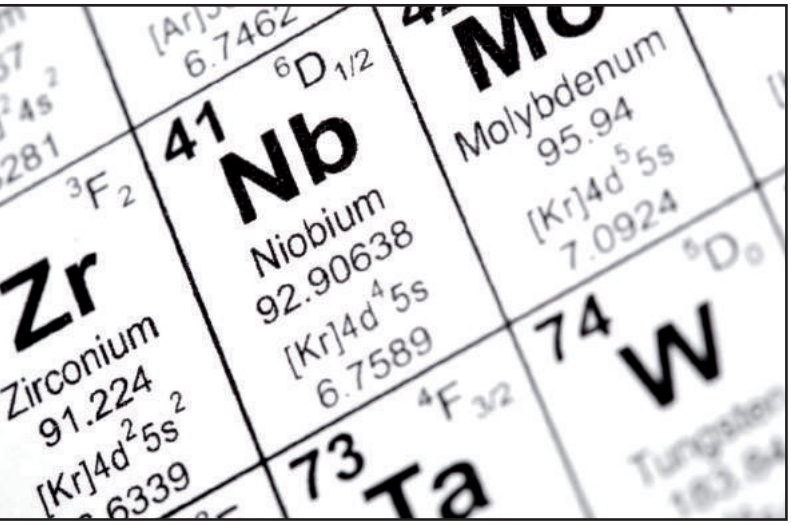
CERN is home to the Hadron Collider, the world's largest particle accelerator and is located in Europe. Research at CERN focuses on looking at how particles interact and how the universe began. At CERN, superconducting wires of niobium-titanium conduct electricity 100 times that of traditional copper wires.

ALKANE RESOURCES LTD

Mining the metals of the future

Niobium

What is it?



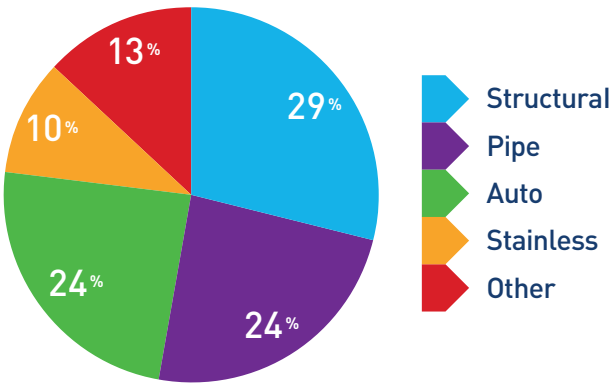
Niobium is a metal with superconductive properties that is used mostly in alloys and superalloys. Niobium is frequently alloyed with steel because of its strength at high temperatures and lightweight characteristics. It is usually sold as niobium pentoxide or ferroniobium; niobium metal is produced in small quantities. The Dubbo Zirconia Project will produce ferroniobium.

"For every 1kg of advanced high strength steel (AHSS) used in a vehicle, there is a total life cycle saving of 8kg CO_2 equivalents. Further, if all vehicle bodies produced globally were fabricated with AHSS, the annual emissions savings is estimated to be 156 million tonnes of CO_2."
www.worldsteel.org/media-centre/press-releases/2009/material-choice-in-car-design.html

World production

Material produced	DZP	World market (2017)
Ferroniobium (FeNb)	3,000tpa	90,000tpa

Current use of ferroniobium



90% of niobium is used in standard grade ferroniobium for the production of advanced high strength steels (AHSS).