

**RIO
TINTO**

Diverse products

The everyday products we use to live our lives depend on the mining industry. We can't spend a day without using a metal or mineral.

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Samples of what's what from metals and minerals

Computers

copper
gold
aluminium
zinc

Lighting and power

energy from coal
copper for transmission

Automobiles

steel from iron ore
aluminium
pig iron (brakes)
copper (radiator, electrics)
borates (window glass,
safety airbag)
talc (dashboard and
bumper plastics)

Homes and offices

steel from iron ore
steel alloyed with molybdenum
zinc
lead
copper
gypsum
paint (titanium dioxide for opacity
and talc for finish)

Leisure

golf clubs (iron ore, molybdenum)
tennis racket (titanium metal)
the gym (steel from iron ore, copper)
personal lifestyle (gold, silver,
diamonds, borates for home and
garden products, talc and borates
for personal care)

Minerals and metals for the world

“If it can’t be grown, it has to be mined”.

The everyday products we use to live our lives depend on the mining industry. We can’t spend a day without using a metal or mineral.

And if it’s not made of metal or mineral, like food or clothing, it can’t be grown, harvested, processed or shipped without infrastructure made of metals. Because metals and minerals are versatile, durable and recyclable they are essential to sustainable improvements in living standards all over the world.

In the production and supply of metals and minerals, Rio Tinto is one of the world’s most diversified companies. The Group is organised in six product groups: Iron Ore, Energy (coal and uranium), Industrial Minerals (borates, titanium dioxide, talc, salt, gypsum), Aluminium, Copper (including gold, silver, zinc, lead, molybdenum), and Diamonds.

Rio Tinto cares about its products, their use and disposal. Through “lifecycle analysis” the Group strives to improve understanding of the health, safety, social and environmental implications of the use of its products and to weigh their costs and benefits to society.

Aluminium

Aluminium is derived from bauxite, a reddish pebbly ore that occurs as a surface deposit at Rio Tinto's large Weipa mine in Australia. It takes approximately two tonnes of bauxite to refine one tonne of alumina, an intermediate product. Two tonnes of alumina is smelted into one tonne of aluminium metal. Rio Tinto operates alumina refineries in Gladstone, Queensland and aluminium smelters in Gladstone, Tasmania, New Zealand and the UK.

Aluminium is a modern metal and one of the most versatile. Almost every aluminium product can be profitably recycled repeatedly without loss of metal quality. Recycling aluminium uses only five per cent of the energy needed to produce the primary metal from bauxite. Its light weight and strength makes it ideal for automobile engines and bodywork, as well as shipbuilding and aircraft manufacture. In the home its non corrosive properties and ductility makes it ideal for doors, window frames, roofing and insulation. Because it is a good conductor of electricity, aluminium is used in the manufacture of electrical wire and transmission cable. It makes convenient packaging material as aluminium foil, drink cans and wrap. Aluminium evaporated in a vacuum forms a highly reflective coating for both visible light and radiant heat. These coatings do not deteriorate as does silver, and are used to coat telescope mirrors and to make decorative paper, packages and toys.

A modern invention, aluminium is light,
versatile and very recyclable.



Heat resistant glass contains borates
that allow the glass to flex.



Borates

Boron is an element only found combined with oxygen, and other elements such as sodium and calcium. Borates is the generic term for these boron compounds. The oldest and most plentiful form of these borates is the mineral salt borax. At present, almost half of the world's refined borates come from the borate ores mined at Rio Tinto's Boron mine in California. Rio Tinto also mines and refines borate minerals from desert lake bed deposits in the Argentine Andes.

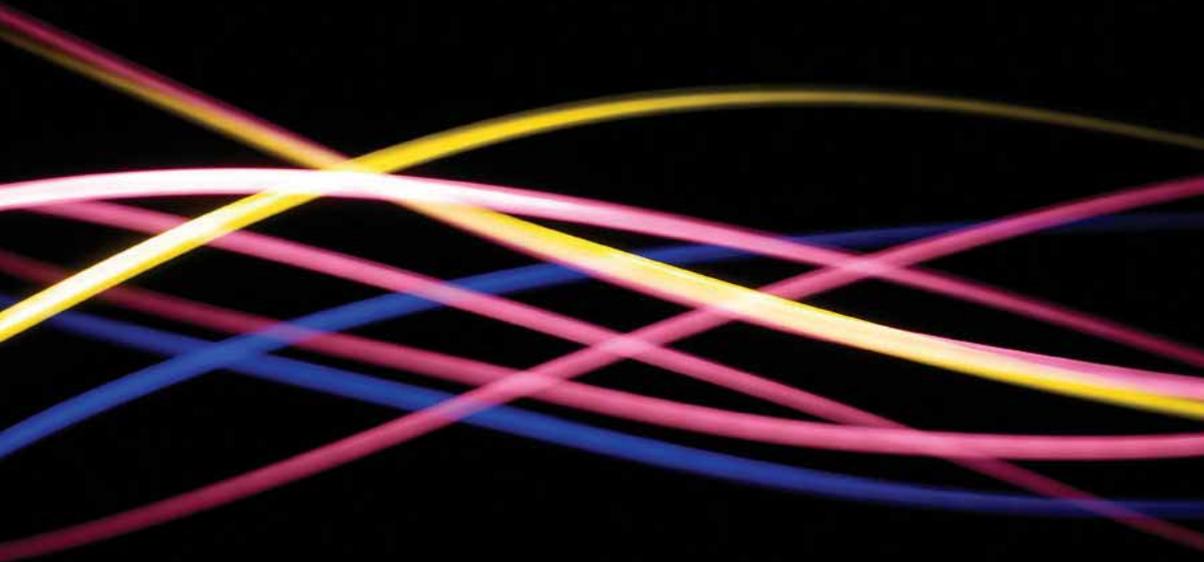
Borates are used in hundreds of products and processes in ways that touch the lives of everyone. Major uses include fibreglass and glass production, ceramic frits and glazes, and agricultural nutrients. When incorporated into glass products, borates make the material more tolerant of contraction and expansion, making them important ingredients in insulation fibreglass, thin film transistors and heat resistant glass. The borates make the glass more flexible, and improve insulation materials' ability to trap heat.

Borates have been an essential ingredient in ceramic glazes for centuries. Borates facilitate a good fit between the glaze and the item it covers – including tiles, tableware and household appliances – and increase the lustre and durability of the finished product.

Boron is one of seven essential micronutrients required for normal growth and fruiting of agricultural crops. Only a small amount is required for proper plant nutrition and to maximise yield and quality in crops ranging from cotton and soybeans to grapes and olives. Rio Tinto provides plant food products to fertiliser manufacturers and growers for bulk blending and liquid applications.



Coal



Coal is plentiful, relatively inexpensive and safe and easy to transport. Rio Tinto is one of the world's largest producers of thermal coal, used for electricity generation in power stations. Electrification is a key aspect of development, and developing countries in particular rely on the cheap electricity that coal provides. All forecasts predict rising energy demand over the next 25 years. Globally identified coal reserves can meet present levels of demand for about 200 years. Coal is a major contributor to greenhouse gases, blamed for climate change. Rio Tinto has accepted the challenge with other producers and with governments to implement over time clean coal technologies to seriously curtail harmful emissions.

Rio Tinto coal mines in the US and Australia supply internationally traded as well as domestic US and Australian markets. Rio Tinto Energy America is one of the US's largest producers and sells its ultra low sulphur thermal coal to electricity generators predominantly in mid western and southern states. Rio Tinto is a leading exporter of thermal coal from Australia. Rio Tinto Coal Australia operates mines which supply local power stations as well as markets in Europe and Asia.

The Group also produces higher value coking, or metallurgical, coal which, treated into coke, goes into furnaces with iron ore to produce steel.

Coal gives us light reliably and economically.





Copper

Copper delivers water, electricity and hundreds of essential products.

Rio Tinto produces six per cent of world mined copper, ranking it fifth in the world. Two thirds of copper is used in electrical applications where it is valued for its high conductivity and efficiency. It is used in wiring for buildings, cars and appliances, for power transmission, and in motors of all sizes. These uses benefit from growing pressure to increase energy efficiency as using more copper reduces energy losses. Another major use is in airconditioning and refrigeration systems where copper acts as a heat exchanger. Copper is also used in plumbing, and a wide variety of architectural uses including roofing sheet.

The copper industry is a great recycler of metal. Scrap metal arising during processing and manufacture of products is all re-used. In addition, almost all copper in current use is capable of being used again. A sophisticated recycling industry ensures its return either directly into the fabricating industry for remelting or into the refining sector for reprocessing. This ensures the optimum use of raw materials and is a vital contribution to a cleaner environment.

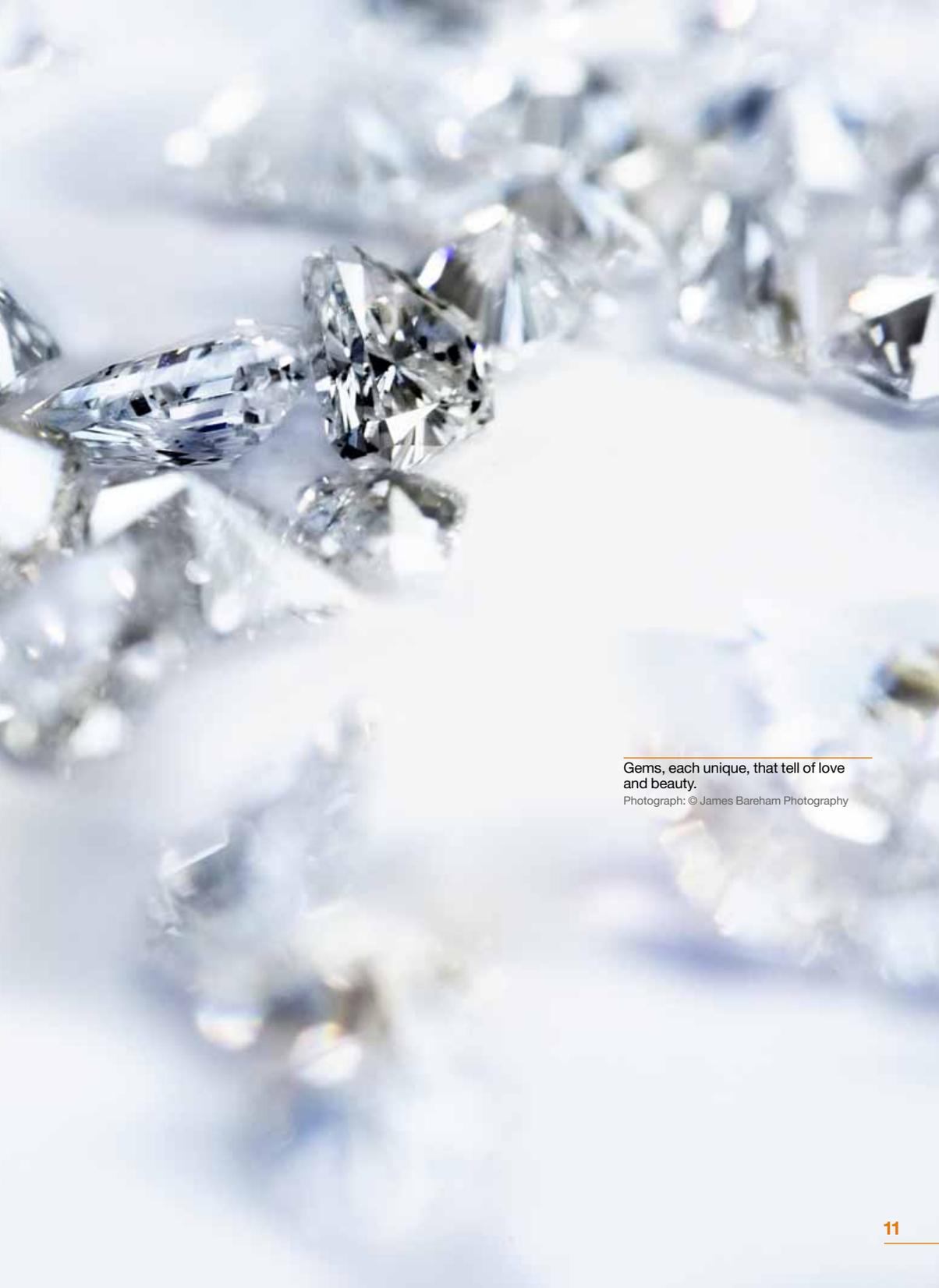
High levels of demand fuelled by China's metals intensive phase of industrialisation have created supply side shortages that highlight the essential nature of the red metal. Figures show the world is not running out of copper but future resources are likely to be harder to develop and more expensive to mine.

Diamonds



Modern mining and processing have contributed to increased ownership of diamonds around the world. Today an estimated 500 million men and women own at least one piece of diamond jewellery. While gem diamonds are not essential to human development in a utilitarian sense, they do serve many higher psychological and social needs. They have come to mark many of life's important rites of passage. Far removed from this glamorous role, industrial grade diamonds, which occur alongside jewelstones, are used as abrasives and drill bits due to their hardness.

Rio Tinto has been involved in diamonds production since 1983 when it created a new market niche for small size, "affordable" gems from the Argyle mine in Australia. Increasing knowledge and expertise enabled Rio Tinto to start marketing all of its own diamond production in 1996. Rio Tinto Diamonds (RTD) operates a sales office in Belgium and a representative office in India. RTD works with customers to provide the products they want. Rio Tinto has positioned itself as a producer and marketer of rough diamonds, rather than moving into polishing and cutting, except for the special case of processing Argyle's unique pink diamonds.



Gems, each unique, that tell of love
and beauty.

Photograph: © James Bareham Photography

Gold

Gold was the second metal after copper taken into use by early humans about 4,000 years ago. Because of its rarity, beauty and ductility, gold has enjoyed a mystique and value unrivalled by other metals and became the first metal of money. Investors regard its enduring value as a hedge against inflation and as a store of value that transcends paper money. Hence its value increases when, in response to world economic uncertainties, there is a “flight to gold”.

Non toxic and biologically benign gold is used in modern medicine, focusing lasers, bonding complex compounds in medicines and helping in genetic research. Outside medicine, gold is at work usually unseen in safety devices such as airbag sensors, gold bonded compressor vanes in aircraft engines and in gold coated infrared equipment to detect dangerous levels of carbon monoxide in the workplace. Thanks to its reflective qualities, gold plays a key role in space exploration, including geostationary satellites and the Hubble telescope. Since the introduction of computers, gold, which does not corrode, has been on the forefront of digital technologies, playing a vital role in circuitry and electronics.

Most gold that is not stored as bullion for investment purposes goes into jewellery. Gold jewellery demand is about 3,000 tonnes per year and exceeds annual mine supply. Gold has always been recycled because of its inherent high value. Your modern jewellery or dental crown may contain some gold that was mined in prehistoric times and formed part of a valued gold artefact or jewellery piece from past civilisations. Today, at least 15 per cent of annual gold consumption is recycled.





Iron ore

Iron is the giant among metals. The modern world is built on the strength and reliability of iron, primarily in the form of steel. The whole infrastructure of modern civilisation, from ships to bridges, railways, skyscrapers, cars, trucks, trains, engines, means of production and machines of all kinds, down to humble pins and paperclips, depend on iron. Iron has given shape and substance to the ideas that have fuelled human progress. We use 20 times more iron in the form of steel, which is iron combined with carbon from coal, than all the other major metals put together. Rio Tinto is among the world's largest producers of iron ore with mines and projects on five continents.

Iron ore occurs as "lump" ore and "fine" ore. Rio Tinto works with its customers to achieve product combinations that satisfy the customers' raw materials needs. This involves appropriate technical support and research to match product quality with customer requirements for their steel mills. Major markets for Rio Tinto iron ore are in China, Japan, the rest of Asia, North America and Europe.

Iron ore in steel forms the basic infrastructure of modern life.

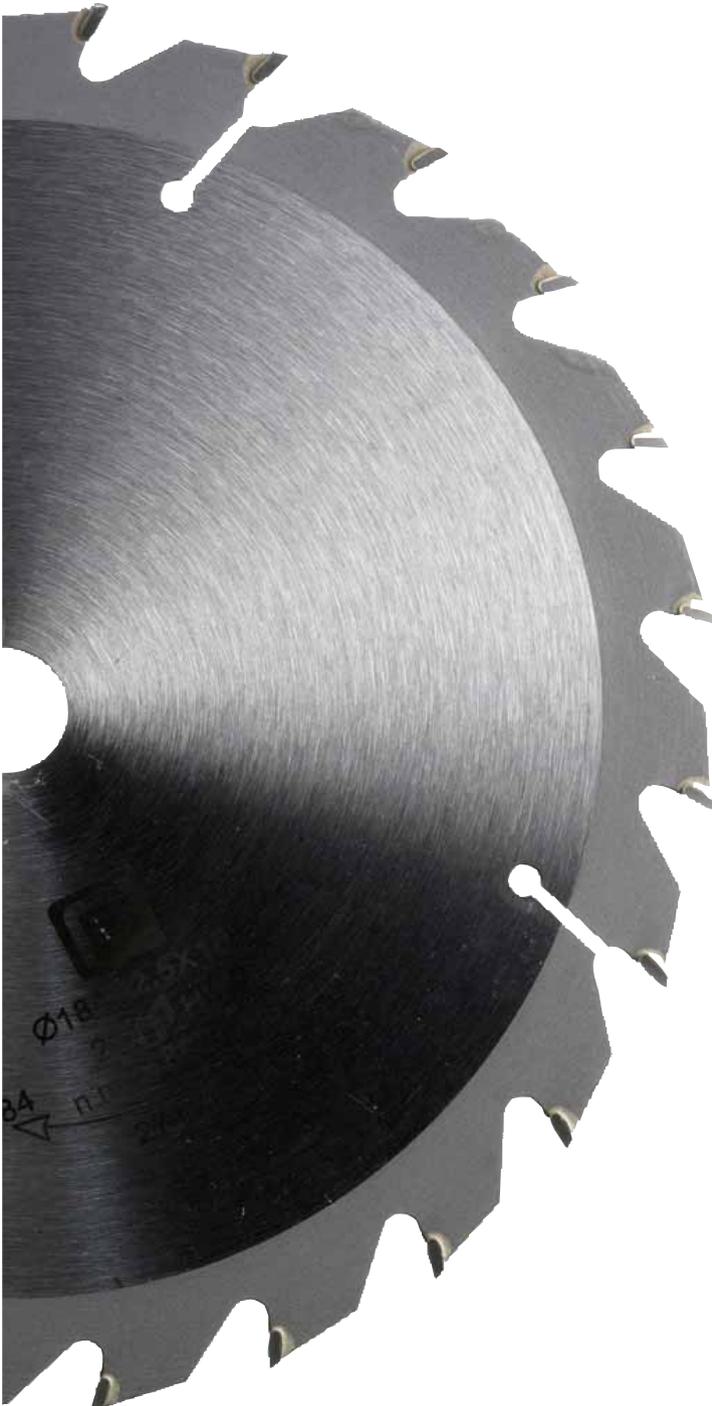
Molybdenum

Referred to as “moly” for short, molybdenum is recovered mostly as a by-product of copper mining. A silvery grey metallic element, it can be confused with lead. But unlike lead, it is hard and has a high melting point of 2,610 °C.

Its most valuable use is to harden high quality steel. Traces of moly were found in the blade of a 14th century Samurai sword. Today it is used as an alloy to produce armour plate, and also in tool making, particularly high speed drills and saws. It strengthens pipework in the offshore oil and gas industry and is used in the exterior cladding of spectacular buildings such as the Petronas Towers in Kuala Lumpur, Malaysia.

One of its valuable features is that unlike other heavy metals, its compounds are of low toxicity. This makes it especially suitable as an alloy material for manufacturing the vessels used in the pharmaceutical, food and chemical industries. A recent application is in a chemical smoke inhibitor to prevent the spread of toxic fumes in an aircraft fire.

Molybdenum puts the hard in special steels.



A natural mineral that makes crops grow more abundantly.



Potash

Potash is a naturally occurring mineral which is used in agriculture to provide potassium to plants. It is an impure form of potassium carbonate (K_2CO_3) mixed with other potassium salts. Potash has been used since antiquity in the manufacture of glass and soap, and as a fertiliser.

Today 95 per cent of potash is used as a fertiliser in worldwide agriculture. Potassium is an essential nutrient for healthy plant growth. Potassium must be added to soils lacking in it or where crops deplete it with each growing season.

Two thirds of the world's potash is produced by three countries: Canada, Russia and Belarus. Only nine other countries produce the rest, including relatively small production in Chile and Brazil. Nearly all countries in the world consume potash. The biggest consumers are the US, China, Brazil and India, none of which has major production of its own. Rio Tinto is developing a potash deposit in Argentina.



Salt

Although salt is best known as an essential mineral in the human diet, it is also one of the basic raw materials for the chemicals industry. Salt is used in the chlor-alkali process which produces chlorine and caustic soda. These are feedstocks in the manufacture of a broad range of chemicals and metals such as alumina for aluminium production, and polyvinyl chloride (PVC) for building products.

Rio Tinto produces industrial salt by solar evaporation of sea water at Dampier, Lake Macleod and Port Hedland on the north west coast of Australia. It takes about 65 million tonnes of sea water to produce one million tonnes of salt from the power of the sun.

Production is a continuous process with sea water being moved slowly through a series of ponds becoming increasingly concentrated through evaporation. When the brine reaches “salting point” (sodium chloride saturation), the salt is then collected by special harvesters. The salt is sold principally to customers in Asia.

From a pinch at the table to making
PVC piping.



Silver

(and its close relatives zinc and lead)

Silver, which is mined with zinc and lead by Rio Tinto, is a good conductor of electricity and, like gold, does not corrode. It is used in many electrical and electronic applications and as the principal ingredient of photographic and x-ray film. Silver is also a metal of beauty, used to make lasting products for the home and person.

Zinc, a silver coloured metal, is mainly used for galvanising. This is a procedure in which a thin layer of zinc is bonded with the surface of steel or iron. The steel or iron is dipped in a molten bath of zinc. The coating prevents corrosion from moisture and weather. Zinc is also widely used in fasteners and machined parts for automotive and other uses.

Lead is a heavy metal but soft and malleable. High purity, high quality lead is used in lead-acid batteries, for automotive and other uses. It is used in finishing applications such as window panes and flashings on the roof of buildings.

Found together in nature, silver, zinc and lead deliver a variety of products.





Talc

Talc is best known as a personal care product, but this is the least of its applications. It is a functional mineral with natural properties such as water repellency, heat resistance and biological inertness that makes it an important ingredient in the manufacture of paper, paints, plastics and many other familiar products. Because each talc orebody differs according to its genesis, every talc is different and can be applied in different functions according to customer needs.

Rio Tinto's talc subsidiary, Rio Tinto Minerals, serves more than 1,000 customers in more than 100 countries, ranging from paper manufacturers who buy 10,000 tonnes per year to pharmaceutical companies who take 100 tonnes per year.

In the coatings industry, talc is used to improve the flow of paint and in decorative coatings it enhances coverage, allowing for savings in the use of titanium dioxide pigments (see page 27). In anti-corrosion systems, talc improves water resistance and adhesion. In pulp and paper manufacturing and recycling, microscopic droplets of resin form deposits that hamper production. Talc absorbs the droplets and keeps them dispersed in the pulp, helping the machines run smoothly and reducing pollution in the water circuit. Talc improves paper's mechanical handling properties and provides a smoother finish and improved readability on the page.

Finest quality talcs give plastic the right balance of rigidity and impact strength, making the material suitable for applications such as vehicle dashboards and bumpers. Talc's contribution to the performance of ceramics stems from its chemical composition from the variety of ore combinations found in different deposits. Associated with silica, talc reinforces ovenware, while with kaolin it improves the thermal properties of refractories.

Smoothness counts in a lot of places and products outside the bathroom.

Titanium dioxide



Opacity for the canvas on which we lay our colours.

Coastal sands can contain the mineral ilmenite, which is 85 per cent titanium dioxide (TiO_2). TiO_2 has the property of reflecting and scattering light in the visible spectrum like thousands of tiny mirrors. When it is incorporated into paints, plastics or paper it imparts a brilliance and opacity of colour to these materials.

Ilmenite is also the raw material of high quality pig iron for the fabrication of ductile iron castings which combine the strength and ductility of steel with the moulding properties of cast iron. Products include safety critical auto parts such as brake calipers and steering knuckles.

Another mineral sand, rutile, is used in the manufacture of titanium metal which, because of its lightness, strength, corrosion and heat resistance, is used extensively in aerospace and aviation to build the engine turbines that jet millions of people around the world each day. Titanium also has medical and scientific uses in artificial hip joints, dental implants and pacemakers.



Uranium



The vital fuel for nuclear power is uranium, a widely occurring mineral. The mined product is uranium oxide concentrate, a dark olive green powder, which is sold to electricity utilities. Rio Tinto follows strict security measures applied and audited by the International Atomic Energy Agency to ensure nuclear material is used only for peaceful purposes. The mine product is inert and no more radioactive than when it was in the ground. To make it of any use it must be “enriched” which involves rearranging the “isotopes”, the different forms of the atomic particles that make up a chemical element. The resulting material is fabricated into fuel rods for power stations.

There are many other ways in which the atom is useful. Radioisotopes and radiation have many applications in agriculture, medicine, industry and research, greatly improving the day to day quality of our lives. Radiation science helps increase genetic varieties of food crops for different climates, and is used in food preservation and to control insects that cause livestock and agricultural losses.

In medicine, the use of radiation and radioisotopes provide x-ray and other diagnostic tools as well as therapy for cancer and other medical conditions. One of the commonest uses of radioisotopes is in household smoke detectors.

Uranium gives clean energy and vital x-rays for diagnosis and therapy.



“Owning” the products we sell

Rio Tinto’s responsibility for its products does not end with their delivery to the customer. A comprehensive programme of “product stewardship” is in place along the value chain to ensure product safety, protect markets, gain value and make a contribution to sustainable development.

Product stewardship includes working with customers to ensure the processing and fabrication of downstream products from Rio Tinto’s metals and minerals is done in a way that is environmentally and socially responsible.

Engagement with customers includes working with them to improve safety and environmental performance standards. The Northparkes gold-copper mine in Australia screens its smelter customers for their environmental performance. The mine works with customers to help gain improvements in their performance. Similar screening has been done for smelting of molybdenum in China.

Rio Tinto Minerals has pioneered a dialogue with one of their main borates customers, Owens Corning, to share best practice on factors that can contribute to sustainable development – such as product “life cycle” management. Rio Tinto Minerals has engaged with customers in China to improve their environmental performance through site reviews and continued dialogue.

To make sure that their product is not processed by child labour or in sweat shops, Rio Tinto Diamonds established the Business Excellence Model (BEM), accrediting Indian diamond cutting customers for environmental practices and good working conditions. This not only assures Rio Tinto of responsible use of its products, but enables diamond cutters to offer a “clean” product to jewellery retailers in countries like the US.

Product stewardship is part of the strategy to integrate sustainable development considerations into Rio Tinto businesses. This includes using the leverage of Rio Tinto’s responsibly produced products to encourage better environmental and social outcomes.

Rio Tinto works to:

- Ensure the use of its products does not harm people's health or the environment.**
- Better understand in partnership with downstream manufacturers the recycling potential of its products.**
- Better understand the future needs for metals and minerals.**
- Promote stakeholder and community engagement in relation to its products.**

For convenience, the expression Rio Tinto is used to describe both Rio Tinto plc and Rio Tinto Limited and companies within the Group, even though these companies are generally separate and independently managed. Ownership: Where Rio Tinto is not the sole owner of a company, the percentage interest is shown.

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Mixed Sources

Product group from well-managed forests, controlled sources and recycled wood or fibre

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