WHAT ARE METALS & MINERALS?

There are thought to be well over 4,000 different minerals, many of which contain metallic elements.

Minerals are solid, naturally occurring inorganic substances that can be found in the earth's crust. They are formed without the intervention of humans and have a definite chemical composition and crystal structure.

Metals are elementary substances, such as gold, silver and copper that are crystalline when solid and naturally occurring in minerals. They often have the characteristics of being good conductors of electricity and heat, of being shiny in appearance and of being malleable. The metals we see day-to-day are produced through the conversion of metallic ores to a final form. This, in the majority of cases, requires the use of chemicals and special technologies.

Common groups of metals

Metals are often categorized into distinct groups defined by their properties or function. The names of these groups are not exact or scientific, but reflect common uses or properties:

Precious metals include gold, silver and platinum. About 90 per cent of total gold production comes from gold mines. The remaining 10 per cent is produced as a by-product from mining other metals, such as copper and nickel. Precious metals are traded on world markets and used in a range of applications from jewelry to electronics to catalytic converters in cars.

Base metals are those of lower value, mainly copper, lead and zinc. Refined forms of these metals are commonly traded on world markets in a variety of standard shapes and sizes. These are the basic building materials for much of the world around us.

Ferrous metals are those with a high iron content, which includes all types of steel. The word "ferrous" is derived from ferrum, the Latin word for iron. Chromium, cobalt, manganese and molybdenum are commonly included in this group because their major use is to improve the properties of steel.

Non-ferrous metals include aluminum, copper, lead, magnesium, nickel, tin and zinc, since they have principal uses unrelated to steelmaking. Note that there is some overlap with the base metals, and the choice of the group name depends on the context.

Rare earth metals are not all that rare in the earth's crust, but their extraction is complex and difficult. They include scandium, yttrium, lanthanum and the 14 elements (lanthanides) following lanthanum in the periodic table. They have widespread uses, though in small volume, in the manufacturing of glass, ceramics, glazes, magnets, lasers and television tubes, as well as in refining petroleum.

Alloys are made by mixing two or more metallic elements to form a new, unique substance that has differing chemical and physical properties to its component parts. Over 90 per cent of the metals in use today are alloys.

Alloying elements are usually added to pure metals to enhance strength or improve particular properties, such as corrosion resistance, wear resistance and ability to be cut. Demanding industrial requirements, such as extreme temperature resistance, strength for high-pressure applications, fatigue resistance, weight reduction or toughness, often

in combination, have led to the development of a wide range of alloys.

The most common alloys are broadly classified as steels. These characteristically strong alloys, formed from iron and carbon, can be mixed with other elements to further improve performance and durability. A car for example, contains more than 10 different steel alloys for body parts, gears, drive trains, crankshafts, valves and so on.

Experts predict that the need for more energy efficient systems, information technology and space exploration will be major driving forces for the development of new alloys in the present century.