METALLURGY

Unusual Metals Go to Work

Little-known metals with strange names, formerly laboratory curiosities, are now finding practical applications, improving common metal alloys or in metallic form.

By A. C. MONAHAN

➤ LITTLE-KNOWN metals are now coming into use — molybdenum, zirconium, selenium, hafnium. Their names are not yet familiar to the man on the street or even the workmen in metal-producing industries.

There is more than a score of such metals, almost unknown outside of laboratories because they are little used. Uses have been a long time developing because the metals are hard to separate from their ores.

Much research is now being done on them because they help to improve properties of common metals. For some, applications for the metals themselves have been found.

These little-known metals, minor metals they are often called, are not necessarily scarce. For instance, they include titanium which is the fourth most plentiful metal in the crust of the earth and the ninth most plentiful chemical element. Its compounds have long been used. Titanium dioxide is one of the principal pigments employed to make white paint white.

The metal itself, which has great possibilities in construction work, has been little used until recently because economical methods of obtaining it from its ores were unknown. Now, however, it is being produced commercially and is suitable for many applications.

Used in Alloys

Many of these less familiar metals will be used only in alloys with common metals to give the latter improved properties, and their names will not come into general use. Nevertheless, workmen in the plants where the alloys are produced will need nicknames. In some plants aluminum and magnesium are called "Al" and "Mag." Molybdenum-steel alloys are called moly-steels. Chrome steel is an alloy of steel containing chromium. In fact, chrome is widely used as an abbreviated name for chromium in various alloys.

Titanium is not a difficult name and need not be abbreviated. It promises to become as well known in the next decade or so as aluminum and magnesium are now. It will be used in alloys and also in metal form.

Methods of getting it in metallic form from its ores have been developed during the past decade by the U. S. Bureau of Mines and by private industries and some 1,000 tons are now being produced in the United States annually. More economical methods will undoubtedly follow soon; then titanium will take its proper place among the structural metals of the world.

Titanium is said to be as near an all-purpose metal as any we already have. It is as strong as steel but far lighter. It has high resistance to corrosion from moisture, salt air and many chemicals. These properties make it particularly suitable for aircraft engines and air frames. Unalloyed titanium is said to be more resistant to projectiles than any armor plate now in use.

Molybdenum is another plentiful metal. In the past decade or two it has come into wide use in steel alloys. "Moly" is a good nickname. Its full name is difficult to pronounce but pronunciation is made easier by dividing it into syllables (mo-lyb-de-num) and remembering the accent is on the "lyb".

An important point about molybdenum is that it is plentiful in the United States. America produces about 30,000,000 pounds a year, which is approximately 85% of the total world production. Some 70% of the metal produced is used in the steel industry. It increases the tensile strength of steel and also increases its resistance to corrosion.

A plentiful supply of molybdenum decreases the need for tungsten, a metal for which America relies on imports. It can be used as a substitute for tungsten in some applications such as in high-speed cutting tools. It has a high melting point, 4,760 degrees Fahrenheit, which gives it special value in alloys to withstand high temperatures.

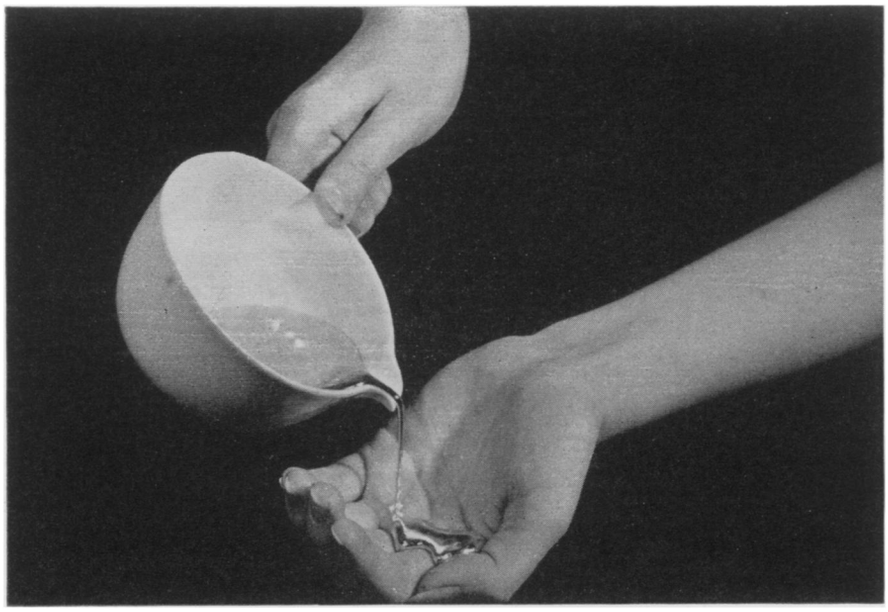
Molybdenum is now in use in the superchargers that make it possible for airplanes with conventional engines to function in the thin air of high altitudes and in the turbo-jet engines that power jet planes.

Big Future for Germanium

Germanium is a metal which the public will hear a lot about in the future because it will play an important part in electronics and may replace vacuum tubes in radio and television sets. It is one of the minor metals and is produced only in very limited quantities, mostly as a by-product in zinc smelting.

Radio and television receivers will be smaller when tiny disks of germanium replace the bulky, fragile vacuum tubes, and reception will not have to await a heating-up interval.

Germanium is what scientists call a semiconductor. An alternating current passing into it comes out a direct current. In addition to being a rectifier it is also an amplifier and increases the strength of the electric impulse many times. Because it can oscillate



POURING MOLTEN METAL—Since gallium, a little known metal, melts at 85 degrees Fahrenheit, it is perfectly safe to pour the molten metal into the palm of a hand, as shown here. Gallium remains a liquid up to about 3,600 degrees and may some day be used for military devices.

as well as amplify, it can be used to produce standard frequency tones and for other use.

Among other little-known metals already in use in engineering are zirconium, tantalum, columbium, vanadium and hafnium. The public will have little occasion to use these names as these metals will find their greatest uses in alloys and in special manufacturing.

Zirconium Quite Common

Zirconium is not a rare metal, being more common in the earth than copper, nickel and lead. But it is hard to separate from its ores and even when separated usually contains hafnium in quantities of from one-half to three percent. For most purposes the presence of the hafnium is not objectionable.

However, in the construction of atomic piles for the atomic energy program, in which most of the zirconium now produced is used, a low hafnium content is needed. zirconium and has somewhat similar prop- it has a low thermal neutron absorption coefficient.

When more zirconium is produced, it will have a special application in corrosion-resisting alloys, particularly for equipment used with hydrochloric acid. The metal hafnium, which is not available commercially as yet, occurs in nature associated with zirconium and has somewhat similar properties.

Tantalum and columbium, the latter known as niobium in some parts of the world, are usually found together in the same mineral and they have similar properties. Separation is a chemical process, carried out with difficulty. An interesting use of tantalum is in surgery, such as in skull plates and surgical wire, because of its resistance to corrosion from chemicals in the human body.

Tantalum Resists Corrosion

Corrosion resistance is one of tantalum's outstanding properties and the one for which it is most widely used. Another important application is in radar and other electronic tubes. Its oxides and carbides are used in high-speed cutting tools. In laboratories, tantalum substitutes for platinum alloy in certain types of utensils.

Columbium in stainless steel improves the alloy's weldability, creep strength, impact strength and corrosion resistance. The metal is a component part of certain permanent magnet alloys, and it is also used in electronic tubes which are subjected to severe service.

Vanadium can not be regarded as a rare metal because it is widely spread and is as plentiful as nickel and zinc. Annual production in the United States is over 2,000,000 pounds a year, much of which is taken by the Atomic Energy Commission for purposes not revealed. In the form of ferro-vanadium, the metal is used in the manufacture of tool steels, engineering steels, high-strength structural steels and special wear-resistant cast irons.

Important in the list of minor metals now finding wider application are lithium, which is only half as heavy as water, beryllium, gallium, indium, boron, cerium, cesium, selenium, tellurium and thallium.

Lithium is used to a slight extent in hardening copper, lead, aluminum and magnesium alloys. Its more common applications, however, are in its chemical compounds.

Beryllium is an important minor metal and would have extensive applications except that the supply is quite limited. It has an outstanding ability to improve mechanical properties of alloys when added in small proportions. Beryllium also is corrosion resistant and seems to have the ability to make the metals with which it is alloyed more able to resist corrosion.

Boron Adds Hardness

A tiny bit of boron, basis of borax, adds hardness to steel. The principal application of cerium is in sparking flints for cigarette lighters, but it is also used in electronic tubes, and its oxide helps to make gas mantles glow.

Cesium, sometimes spelled caesium, is used in photoelectric cells because it gives up one electron more readily than any other element.

The principal application of indium is in heavy-duty composite metal bearings, although it is also added to solder and brazing alloys to give a low-melting alloy.

A valuable property of selenium is its change in electrical conductivity when exposed to light. For this reason it is used in the so-called electric eyes which not only make doors open automatically, but also help to sort, count and scan a wide variety of things, from money to tin cans. Selenium can also rectify electric currents.

Both selenium and tellurium improve copper alloys. Tellurium is used to tone silver prints.

The chief application of thallium has been as a rodent poison in grains, but there is a present interest in some of its compounds. One of these will transmit wavelengths in the infra-red region and was used in sniperscopes during the war to detect enemies prowling about in the night by the heat given off from their bodies.

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TECHNOLOGY

New Brick Lowers Cost Of Masonry Dwellings

➤ A COST-CUTTING brick which should bring masonry dwellings within the pocketbook range of more persons has been introduced by the Structural Clay Products Institute in Washington.

Robert B. Taylor, director of research for the Institute, reported that the new SCR brick could be used to build one-and-a-half story houses at a price competitive with high-quality frame dwellings of the same size.

A five-room pilot house was built using the new brick in the outside walls. The brick's performance was satisfactory and acceptable under major national building codes.

Actual construction tests under normal conditions showed that a mason can build from 60% to 100% more wall area per day using the new brick. That equals about 100 square feet of wall per day. This figure is considered conservative by the Institute.

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