CHEMISTRY

New Chemical Theory

A new chemical theory, one of the most significant in recent years, will help accelerate the development of new materials for use in space, nuclear and other technologies.

➤ A NEW CHEMICAL THEORY that will allow chemists to predict properties of high temperature metal alloys for nuclear and space technologies has been reported.

Dr. Leo Brewer, director of the inorganic materials division of the Lawrence Radiation Laboratory, University of California at Berkeley, has proposed a comprehensive theory which links atomic structure with the physical properties of 30 of the transitional metals.

The conception, called "an electron theory of crystal structure," is based upon the work of Dr. Niels Engel, a Danish chemist now on the Georgia Institute of Technology faculty and at Oak Ridge National Laboratory.

Dr. Engel's original research on the relationship between electronic and crystal structures of the transitional metals had remained relatively unknown until recently.

The theory promises to have sweeping implications for predicting behavior of transitional elements from which Space Age materials and alloys will be made.

Dr. Brewer and his staff have formed a hypothesis that combines Dr. Engel's original ideas about the sizes of atoms with Dr. Brewer's experimental data about physical and chemical properties of the transitional metals.

Chemists have long been able to arrange the elements into an orderly sequence known as the periodic table, which arranges the 103 natural and man-made elements from the smallest atom, hydrogen, to the largest, lawrencium.

Particles called electrons move at terrific velocities in "orbits" around an atom's nucleus. However, there are a number of metals, the transitional metals, which have electrons missing from their "orbits."

Up to now it has been very difficult to predict the properties of these transitional elements, because of their ability to act in a number of ways chemically.

The transition metals include such traditional materials as iron and chromium as well as exotic metals of growing interest such as titanium, zirconium, niobium, tantalum and molybdenum.

Dr. Brewer's work has now taken the guesswork out of predicting properties of alloys of these elements. Literally, the physical properties of billions of compounds may be known without ever testing them by costly trial-and-error research.

The critical need of Space Age technology for materials that can withstand the severe temperature stresses imposed by outer space can also be served by the greatly accelerated development of "exotic" alloys of transitional metals. Dr. Brewer's studies are expected to pave the way for these research efforts.

Dr. Brewer and his staff at Berkeley are verifying their findings.

Dr. Brewer proposed his theory at the International Materials Symposium, Berkeley, Calif.

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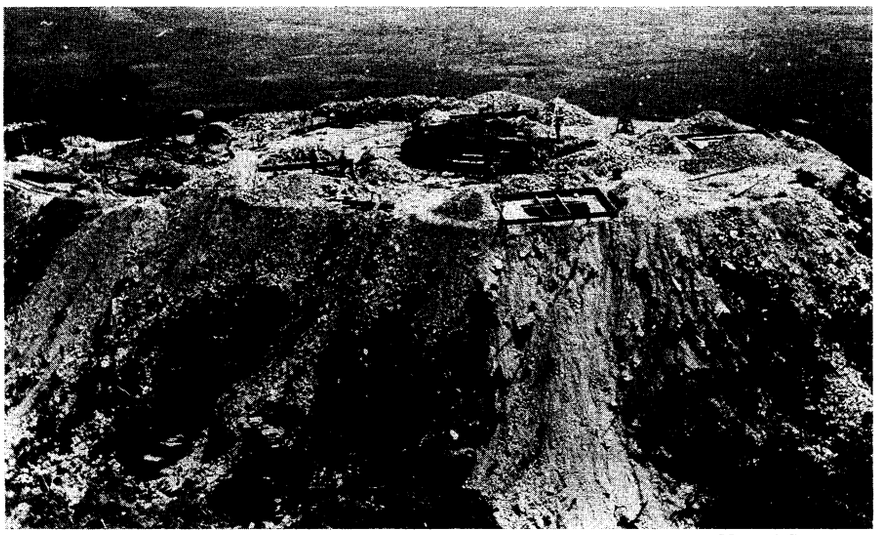

Marconi Company

MOUNTAIN TOP TOPPED—The whole top of the mountain at Ajangote, Ghana, was removed to build a television transmitting station covering Accra and the surrounding district. The work is being done by the Marconi Company of England at the request of the Ghanaian Government to expand the country's broadcasting facilities.

CHEMISTRY

Lifetime of Atomic Nuclei Extended

➤ "IMPRISONMENT" of radiation has been successfully used by scientists to prolong the lives of atomic cores, or nuclei.

The atoms are radioactive ones that normally disintegrate in the same way and in a predictable period of time, called the half-life. Their lifetimes are not normally affected by heat, pressure or other changes.

Now scientists at Westinghouse Research Laboratories, Pittsburgh, have extended the lifetimes of two atoms, tin-119 and iron-57, by as much as three percent. The extension is achieved by controlling, or "imprisoning," the radiation normally emitted by these atoms when they decay.

The team was led by Dr. Kuan H. Sun, who said the experiments depend upon the fact that the property of lifetime belongs to the entire group of nuclei being tested, not to one single atom.

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TECHNOLOGY

Probable Energy Control By Fluids Unveiled

➤ THE ENERGY of fluids in the service of man, harnessed in the artificial heart pump of today, may well control the computers and turbines of tomorrow.

Such an idea was suggested by B. M. Horton, technical director of the U.S. Army's Harry Diamond Laboratories in Washington, D. C., before the Army Science Conference for some 500 military scientists and engineers at West Point, N. Y.

Mr. Horton suggested that energy exchange or flow can be considered as the basis for all life processes. By finding a method of controlling this energy flow, one could drastically alter the living standards of man.

One way to accomplish this control of energy is by means of fluid control amplifiers, a concept originated by Mr. Horton and his research staff.

The fluid amplifier controls the energy flow of one liquid or fluid by the use of a fluid, such as air or water, of less energetic flow. The control fluid acts like one's wrist directing the flow of a forceful stream of water through a garden hose with the aid of a nozzle, controlling the rate, force and direction of the water from the hose.

In artificial heart pumps, as well as in turbines, this principle may be employed. However, the fluid amplifier's range of possibilities is far from being limited to these situations.

Mr. Horton's fluid amplifier, using "no moving parts," may find use in rocketry, high temperature research and computers. His research on fluid amplifiers has already yielded a simple type of integrater, a computer part.

Since 1959, more than 100 companies have begun to look for further commercial applications in defense and industry for the fluid amplifier.

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