

GENERAL SCIENCE

Atomic Power Materials

Unusual substances, among them combinations of ceramics and metals known as cermet, are being tested both as moderators and shields for atomic furnaces.

➤ MATERIALS MUST withstand extraordinary temperatures, unusual corrosion and the battering of atomic radiation in order to be useful in atomic power developments.

Unusual ceramic materials are finding a use in the Atomic Energy Commission program, it is revealed in the Fourteenth Semiannual Report of the Commission. Many of these new materials with unusual properties are ceramics, in the same class as bricks, dinnerware and glass.

From the time of the first atomic furnace or reactor some materials such as graphite, beryllium oxide and portland cement have been used both to moderate the power-giving chain fissioning of uranium or plutonium, and to shield against the powerful radiations developed.

Materials that have been rare heretofore are being used in many cases. There is a large program under way for the production of zirconium and hafnium because of their usefulness in the Atomic Energy Commission program.

Zirconium was until recently a little used and little known metal, yet the Atomic Energy Commission is going to buy 375 tons of this metal during the next five years at a cost of \$13.46 per pound. Research is underway on zirconium as well as on titanium, vanadium, thorium and niobium as Atomic Energy Commission materials.

At the Oak Ridge National Laboratories combinations of ceramic materials and metals, called cermet, are being studied intensively. There and at Argonne laboratories and Battelle Memorial Institute there are explorations into the properties of the number of oxides, nitrides, borides and carbides for use in reactor construction.

An attempt is being made to develop a new kind of stainless steel alloy that can be used under very corrosive conditions at high temperatures. There is already one stainless steel that is suitable for high pressures but not at high temperatures under corrosive conditions.

There is another steel that stands up under severe corrosion but not at high pressures. An attempt is being made to develop a welding alloy that will have the best qualities of both of these stainless steels.

One of the first successful methods for applying a ceramic coating to commercial nickel has been announced by Oak Ridge National Laboratory, Oak Ridge, Tenn., operated by Union Carbide for the Atomic Energy Commission.

Nickel is one of the refractory metals, possessing excellent heat conducting characteristics, but it is limited in its use at high temperatures because of its poor resist-

ance to oxidation. The new coating process may permit the use of nickel in jet engines, gas turbines, guided missiles and other high-temperature devices.

The coating method, developed by a group headed by G. D. White, consists in annealing nickel specimens in water-saturated hydrogen at a temperature of 1,000 degrees Fahrenheit. The specimens are then sprayed with National Bureau of Standards ceramic coating A-418, dried and fired.

The durability of the coating was tested by heating the specimens in an oxidizing atmosphere at 1,500 degrees Fahrenheit for 65 hours. At the end of the test, the specimens still had a good appearance and showed improved adherence of the coating. The advantage of using wet hydrogen over dry hydrogen in the annealing process is shown by the durability of the coating at elevated temperatures obtained with wet-hydrogen-annealed nickel, compared with the bubbly surface condition produced on specimens that had been annealed in an atmosphere of dry hydrogen before coating.

Science News Letter, August 8, 1953

ELECTRONICS

Fast-Flipping Switch Helps "Brain" Memory

➤ A FAST-FLIPPING silicon switch has been developed that keeps electronic "brains" from getting amnesia.

Officially called "silicon alloy junction diodes" by Bell Telephone Laboratories engineers who developed them, the switches permit electricity to flow only in one direction.

If the current tries to move in the opposite direction, the match-head-size devices throw up great resistance. Measurements show that current leaking backward through ordinary vacuum tube rectifiers can be a thousand times greater than the amount that can get past the sturdy resistance of the silicon alloy diodes.

By passing a tiny charge of electricity to the plates of a condenser, the tiny switch permits complex electronic "brains" to store one bit of information. By keeping the charge from leaking off the condenser, the diodes prevent the brains from forgetting.

An outgrowth of transistor research, the junction diode works thousands of times faster than its best mechanical counterparts. It requires no filament, therefore needs no warm-up time before working properly. It can withstand high temperatures. Engineers predict its lifespan "should be almost unlimited."

Science News Letter, August 8, 1953

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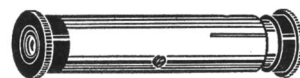
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