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TREATMENT OF HIGHLY REACTIVE METALS

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This invention relates to the treatment of highly reactive metals and has for its object certain improvements in the treatment of highly reactive metals. The present invention relates more particularly to the treatment of such highly reactive metals as the alkali metals, as well as to the treated metals as articles of manufacture.

Due to their highly reactive characteristics, certain alkali metals are useful in the refining of other metals. Among such highly reactive metals may be included calcium, magnesium, sodium, lithium, barium, potassium and the like. Some of these metals have been employed as deoxidizers, desulphurizers and decarbonizers in the treatment of various materials. Such metals are difficult to store and handle because of their great affinity for constituents taken from the atmosphere. A stick or bar of metallic calcium, for example, on continued exposure to the air gradually disintegrates into a pulverulent mass. This disintegration is not alone due to contact of the metallic calcium with oxygen of the air, but results in part by reaction with hydrogen, nitrogen, carbon, sulfur and the like taken from the air and the humidity in the air. The calcium on exposure to the air disintegrates into a pulverulent mass, and is no longer calcium; but is a compound of calcium, such as calcium carbonate, calcium nitrite, calcium carbide, etc. When it is desired to employ the highly reactive metal in a solid mass, such disintegration is of course objectionable. Even though the metal may be confined in air-tight containers, such a procedure is at best inconvenient. Those working around the material tend sooner or later carelessly to expose the metal to air, when disintegration promptly sets in.

In my copending application Serial No. 464,697, filed June 28, 1930, I have disclosed and claimed, among other features, various methods of preparing and conditioning highly reactive metals so that they may be rendered more usable. Said application particularly contemplates a mechanically agglomerated admixture of one or more highly reactive metals of the alkali metal group with one or more other metals, such as iron or copper and the like. Such agglomerates or briquettes may be made relatively porous or solid, depending upon the pressure employed to produce them; or the manner in which they are otherwise prepared.

As a result of my further investigations along these lines, I have determined that the highly reactive metals may be so treated as to inhibit disintegration due to reaction while in contact with the air, and thus keep them as metals until they are subsequently employed. Sticks or bars or other masses of the highly reactive metals may be appropriately treated with an essentially non-reactive substance to offer a suitable protective covering or coating.

According to the present invention, a highly reactive metal or metals is provided with a suitable protective covering, the covering being adapted to keep the metal or metals out of contact with air. The invention also contemplates the thus protected or covered reactive metal as an article of manufacture.

While it is customary in common practice to employ a single given highly reactive metal for the purpose of effecting the purification of other metals, in some instances two or more highly reactive metals in one single mass may be employed at the same time. In the practice of the present invention, it is therefore contemplated that one or more highly reactive metals may likewise together be suitably provided with a protective covering or coating to avoid disintegration when exposed to air.

Furthermore, the metal or metals to be protected against disintegration may be put-up in various ways. Thus, the highly reactive metal may be present as a solidified mass. On the other hand, the highly reactive metal or metals may be appropriately agglomerated or briquetted with one or more other metals, not so highly reactive, such as disclosed in my copending application, after which the protective covering is provided on surfaces normally exposed to the open atmosphere.

When the highly reactive metal or metals is to be present as a solidified mass, the mass

may be put-up in various ways. Thus, the highly reactive metal may be solidified in the form of sticks or bars. Due to their great affinity for oxygen, hydrogen, nitrogen, carbon, sulfur and the like, of the air, every precaution should be taken to solidify the molten highly reactive metals out of contact with air as much as possible.

According to one procedure, the molten reactive metal, such as calcium, may be poured into metallic cartridge forms; which are essentially cylindrical in shape, with one end closed. The metal of the cartridge form of course has a higher melting temperature than that of the reactive molten metal introduced. The molten metal is poured into the open end, thus finally leaving only a very small surface of calcium exposed to the open atmosphere. When the molten metal has appropriately solidified, the protective covering or coating may be provided on the normally exposed surface; or the upper end of the cartridge form may be tightly crimped or otherwise appropriately closed; thus keeping the contained calcium out of contact with air and moisture.

The highly reactive metal may be retained in the cartridge form, and used as such in a subsequent purification treatment operation. If, for example, copper is to be subjected to a purification operation, the cartridge shell may advantageously consist of copper. The loaded cartridge, containing the solidified reactive metal, such as calcium, may then be subsequently immersed in molten copper to be purified. It will of course be apparent that any suitable metal shell may be employed in which to introduce and hold a highly reactive metal.

In order to put-up the highly reactive metals in a form readily usable in commerce, other procedures may be followed: Thus, molds may be employed that are adapted to contain a maximum amount of the molten reactive metal with a minimum exposure of that metal to the open atmosphere. In this manner, solidified spheres or cubes or the like of the highly reactive metal may be produced. These masses are then suitably provided with a protective covering or coating; such as by dipping or immersion in, or by spraying, a liquid of appropriate composition.

As indicated above, the protective covering should consist essentially of a non-reactive substance; that is, at least non-reactive to the metal to be protected. For example, a mass of highly reactive metal may be provided with a coating of appropriate water glass, such as the well-known silicates. Nitrocellulose preparations may be applied to exposed surfaces of the highly reactive metal mass. Certain varnishes are appropriate for this purpose. Suitable molten salts may also be applied to the mass to be protected. A borax solution is effective as a protective agent. Paraffin may be used; as may bees-wax. In fact, I have found a mixture of paraffin and bees-wax to be particularly effective. The covering or coating should be one that does not readily crack and thus open small areas to air exposure. All of these protective agents are properly brought in direct contact with exposed surfaces of the mass of highly reactive metal.

The highly reactive metals may, however, be otherwise protected. Thus, a special shell-like non-metallic covering may be placed around and about the metal mass. For this purpose, the well known cellophane coverings may be employed. In fact, shell-like metallic coverings may be used, such, for example, as tin foil, lead foil, aluminum foil or the like. Other procedures, falling within the principles of the present invention, will undoubtedly occur to those skilled in this particular branch of metallurgy.

I claim:

As a new product, calcium having applied to the surfaces thereof which would normally be exposed to the atmosphere a protective covering consisting of a mixture of paraffin and bees-wax.

In testimony whereof I affix my signature.

CHARLES HARDY.