after removal of the starch, when the presence of fungi and other foreign substances are revealed.

It appears that in certain sections of the country the adulteration of flour, as of other powdered commercial products, is still practiced, yet it may be said that as a rule the article as found in the eastern markets, represents a higher grade of product than has formerly been reported.

The investigations of the writer indicate certain profitable lines of work which are of immediate practical value, and it must be said that much still remains to be done, particularly in the micro-physical examination of the different starches; and the author is of the opinion that as much useful knowledge will be secured by the utilization of the polariscope in this field of work, as has already been disclosed by other methods, the usefulness of this instrument having been demonstrated in the examination of the products made from plant and other fibers.

The author is indebted to Professor Higley, of Northwestern University, and to J. W. Dietrich, of Galesburg, Mo., for assistance in procuring samples; and to Miss Florence Yaple, of the Philadelphia College of Pharmacy, for the performance of much experimental work in the course of the investigation.

---

[CONTRIBUTIONS FROM THE HAVEMEYER LABORATORIES OF COLUMBIA UNIVERSITY, NO. 10.]

## PREPARATION OF GRAPHITOIDAL SILICON.[1]

BY FREDERICK S. HYDE.

Received April 12, 1899.

THE analogy between silicon and carbon in their allotropic modifications, especially the graphitic, and the existence of a crystalline compound of silicon and carbon, known as carborundum, have tended to create doubt as to the purity of graphitoidal silicon, yet the production of the latter seems to be based on reactions favoring the exclusion of carbon.

The usual methods involve the reduction of potassium-silicofluoride with aluminum or metallic sodium; or the reduction of pulverized white sand with magnesium powder.

The method submitted depends on the reduction of finely pul-

[1] Read at the meeting of the New York Section of the American Chemical Society, March 10, 1899.

verized white sand with magnesium powder and the subsequent fusion of the reduction-product with cryolite and aluminum, to form an alloy of aluminum and silicon, from which the latter is obtained on treatment with hydrochloric acid.

For experiment take :

| | Grams. |
|---|---|
| Finely pulverized white sand | 12 |
| Magnesium powder | 3 |

Mix thoroughly, place in a dry test-tube, supported by a clamp on a ring stand, warm gently, and then commencing at the lower end ignite cautiously with the burner in hand.

There may be a slight separation of the contents due to the expansion of air or moisture, which should be remedied. As the heat becomes concentrated at the lower end, the contents become darker, resulting in a quiet incandescence which creeps toward the upper part, usually completing the reaction with a slight puff. The exterior surface of the test-tube assumes a greenish black lustrous appearance and becomes wrinkled or "buckled" from the heat of the reaction. Remove the contents, which are brownish black in color ; pulverize and mix with a sufficient quantity of cryolite powder.

Introduce the mixture into a small Denver crucible, containing a piece of aluminum (walnut size) on the bottom. The cryolite serves as a vehicle for incorporating the reduction product with the aluminum and as a flux for impurities. Place the crucible in a small gas furnace and apply blast.

As soon as the aluminum liquefies, stir the mass thoroughly with an iron rod. Quite a little stirring is necessary in order that the molten aluminum may be brought into contact with every portion of the reduced mass. Near the final stage, fumes and tongues of bluish flame, like burning zinc, may be observed on the surface. Allow to cool.

Remove the regulus, which should have a brilliant silver-white crystalline surface, and examine the blackened slag for any small globules of alloy. Place the regulus and globules in a porcelain dish or casserole, and treat with warm hydrochloric acid. As the aluminum dissolves, black glistening spangles of silicon separate out of the solution. Decant and wash with clear water. Then wash with alcohol and dry on the filter.

Some employ zinc to form the alloy, but aluminum is preferable for the following reasons not stated in the text-books:

*First.*—Zinc melts and volatilizes at a comparatively low temperature, before the silicon has a chance to become properly alloyed. It is also difficult to combine the reaction-product with molten zinc, since the latter is heavier and causes the former to float.

*Second.*—The copious white fumes and blue flame evolved by zinc, even though the crucible be covered and the oxidation minimized, cause large amounts of "zinc wool" to condense on the interior of furnace and crucible, thus interfering with the operation.

*Third.*—The zinc-silicon alloy is hard and resists solution with hot or cold hydrochloric acid, while the aluminum alloy is readily dissolved.

*Fourth.*—Zinc tends to produce needle-shaped crystals of silicon, which are not so striking as the graphitoidal spangles obtained from the aluminum alloy.

Graphitoidal silicon resists oxidation before the blowpipe. Under the microscope, by reflected light, the faces of incomplete octahedra are visible in the small irregularly shaped masses. The yield is rarely more than ten per cent. by weight of the silica employed.

There are indications that the element silicon itself, heretofore classed among laboratory curiosities, may become commercially important.

On account of its high electrical resistance, its use in the form of compact rods has already been suggested for electric heating apparatus.

---

## THE COMPARATIVE VALUE OF CERTAIN REAGENTS FOR REMOVING LIME AND MAGNESIA FROM NATURAL WATERS FOR INDUSTRIAL USES.[1]

BY MARTIN L. GRIFFIN.

Received May 8, 1899.

IT is only within the past few years, fifteen to twenty possibly, that the purification of water mechanically and chemically has claimed the serious attention of engineers and chemists. Everything is done on such a vast scale to-day and competition is

[1] Read at the meeting of the New York Section of the American Chemical Society, May 5, 1899.