100 cubic centimeters of water and agitate violently for about one minute. The oil immediately becomes sub-divided without, however, increasing the mixture greatly in viscosity. Standing for any length of time does not appear to influence the oil in the matter of coalescing into globules or drops. The mixture has a tendency to separate into a lighter aqueous layer and a heavier layer of microscopic globules of oil, but even after more than a year's standing in a number of specimens which I have made, there has been no tendency in the oil to run together into larger globules.

For volatile oils that are lighter than water, the amount of emulsifying powder that is to be taken is about two and a half times that required for the heavy oils. In these cases the emulsification is equally permanent, and very satisfactory for purposes of making the so-called concentrates which are employed for adding to syrups in the preparing of flavors for the carbonated beverage industry. Experiments with the emulsifying powder with immiscible liquids like chloroform, ether, benzene, kerosene gave rather unsatisfactory results. With fixed oils the results are not as good as ordinary emulsification materials.

The facts are simply published for the benefit they may have for those who are studying the subject of emulsification and a practical aid in making volatile oil concentrates, miscible with syrup to be used for flavoring purposes.

RESEARCH LABORATORY,
PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE,
PHILADELPHIA, PA.

NOTES ON SILICA GEL AS A FILTERING AGENT.*

BY E. V. HOWELL.

Silica gel is chemically a hydrated form of pure silica and is accordingly extremely resistant to most reagents.

Physically it is a hard, semi-transparent, glassy substance. Its hardness, according to the mineral scale, is about 5 and it undergoes but little abrasion with ordinary handling.

The word "Gel" does not, however, accurately suggest the physical nature of the material as used, but rather refers to its condition at one stage of manufacture. It is a hard, glassy material, with the appearance of a clear quartz sand and having the chemical formula of SiO_2. The thing that differentiates this unique material, silica gel, from ordinary sand is its highly porous structure, and especially the size and uniform arrangement of the pores.

Silica gel is made by mixing, in proper proportions and in a pre-determined manner, solutions of sodium silicate and sulphuric acid. After several hours this mixture sets to a homogeneous, jelly-like mass, which is called hydrogel. This hydrogel is then broken into pieces about one inch in size and thoroughly washed to free it of sodium sulphate and excess acid. It is subsequently dried in a carefully regulated manner until it has shrunk to a constant volume (about 10% of its original volume). It is then known as "Silica Gel" and is ready for the final activation necessary before it can be used in any of its many applications. This activation is

* Section on Practical Pharmacy and Dispensing, A. PH. A., Buffalo meeting, 1924.

accomplished by heating the silica gel to a moderate temperature in a stream of air for a few hours.

Silica gel, as has been mentioned, is a very porous substance. It is claimed that the pores, which are ultramicroscopic in size, form approximately 41% of its total volume. As there is not a microscope of sufficient magnifying power to make it visible to the eye, the internal structure of silica gel is very difficult to describe. This has been determined, however, by the observation of its behavior. It seems to consist of a uniformly arranged aggregation of extremely small spherical particles of pure SiO_2, such spherical particles touching one another and thereby forming voids between them, which have been referred to as pores of ultramicroscopic size. The surface of these particles in a given weight of silica gel is of extremely great dimensions. For instance, it has been mathematically worked out that one gram of silica gel exposes an internal surface of approximately five thousand square feet.

The writer at the time this title was sent in had failed to see an article on this subject by J. C. Krantz, Jr., JOUR. A. PH. A., Vol. XI, No. 9, p. 701. For this reason merely notes will be given.

In experiments with aqueous solutions we used only one-third as much silica gel as purified talc and found it more satisfactory, except as to cost. For alcoholic preparations we found it unsatisfactory. This does not agree with previous reports, and we have no way of establishing the fact that our samples and those used by others were the same.

In addition to effervescence and a crackling noise, on adding silica gel to alcohol, we had a rise in temperature. Twenty grams of granulated silica gel added to 60 mils of denatured alcohol, garage type, raised the temperature from 27.5° to 38° C; the powdered variety, in the same proportions, from 27.5° to 39°C. On ethyl alcohol 20 grams of the silica gel, either powdered or granulated, raised the temperature from 29° to 39° C.

The thought occurred that perhaps silica gel might remove water from alcohol. However, an alcohol, specific gravity 0.805 at 25° C., was filtered through silica gel. It was not clear on the third filtering and the sp. gr. instead of being lowered was increased to 0.810. Just what action takes place I have not had time to investigate but thought it worthy of attention. Another point in this connection is that when substances that liquefy on trituration, as thymol and menthol, are dissolved in paraffin oils, as in the sprays of the "National Formulary" and the "British Pharmaceutical Codex," a cloudiness is produced. With the present directions of the N. F. one would naturally rub them together in a mortar before dissolving. The cloudy solution will become clear at once on filtering through silica gel. If the N. F. directed that thymol be dissolved in a portion or all of the paraffin oil and then the camphor, this cloudiness would be obviated. No work has been done as yet to see if there is any change in the menthol and camphor in the finished preparation, when triturated together and dissolved or when dissolved separately. In appearance and odor there was no appreciable difference.

The work of the experiments has given the following results:

1. Silica gel can be used in place of purified talc in aqueous preparations.

2. Silica gel requires only about one-third as much as purified talc in aqueous preparations.

3. Silica gel lessens the time in making preparations, as it helps filtration to become more rapid.

4. Silica gel will not take the place of purified talc in the presence of alcohol.

5. Alcohol on silica gel produces an effervescence and a rise in temperature. This should be investigated.

THE TRAINING OF THE PRACTICAL PHARMACIST.*

BY WILLIAM J. HUSA.[1]

The aim of the College of Pharmacy of the University of Florida is to turn out *practical* pharmacists. This does not imply that we do not wish our graduates to know pharmaceutical theories, but rather that we want them to have such a thorough and sound knowledge of theories that they can correctly apply them and put them to practical use in producing superior pharmaceutical service.

Our three-year course is primarily a course in pharmacy, pharmacognosy, and pharmacology. A course in botany is given to serve as a foundation for the study of pharmacognosy. Anatomy and physiology are included to prepare the student for his work in pharmacology, bacteriology, and biological standardization of drugs.

The courses in general chemistry, qualitative and quantitative analysis and organic chemistry lead up to the work in toxicology, physiological chemistry, clinical testing and drug analysis.

We give a brief course in hygiene, and some work in physical training and military drill, so that our students may grow toward that worthy ideal of "a sound mind in a sound body."

I will now point out in somewhat more detail what we do in pharmacy proper, which is my own particular field. During the first half of the first year we cover the field of pharmaceutical arithmetic, including thorough study and drill on the various systems of weights and measures. The state boards of pharmacy recently have given this important subject greater recognition, by including in their examinations a separate paper on pharmaceutical and chemical mathematics.

During the second semester of the first year we take up the history of pharmacy and pharmaceutical literature and a study is made of the apparatus and processes used in pharmacy. Considerable attention is devoted to the fundamentals of pharmaceutical Latin and the student makes a good start toward the acquisition of a Latin vocabulary suited to the needs of the pharmacist. In this and succeeding courses, each student prepares several hundred U. S. P., N. F., and special preparations. In this work the student is taught that cleanliness and accuracy are absolutely essential and each student must keep his utensils, desk, and balances spotlessly clean. The students are told that a good pharmacist leaves no tracks.

Time will not permit a detailed discussion of each course, so suffice it to say that the work on theoretical and practical pharmacy continues into the second and third years. Some work is also given in commercial pharmacy, and thorough courses in prescriptions and dispensing, and in drug analysis.

---

* Presented at the 22nd Annual Convention of the Florida Pharmaceutical Association, Lakeland, Fla., June 19, 1925.

[1] Professor of Pharmacy, University of Florida.