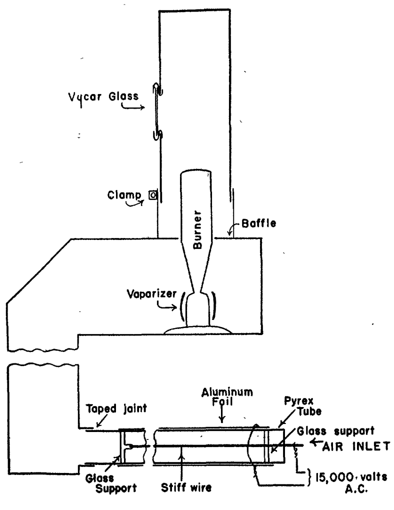

FIG. 1. Air cleaner attached to the inner, airtight chamber of the flame photometer.

achieved by constructing an inner chamber of sheet metal connected to a wide tube leading forward and downward just behind the control panel to the air-cleaning mechanism, the top of which was connected to the metal chimney provided in the machine. The windows in the chimney were closed with "Vycor" glass mounted in metal brackets.

The requisites for an air-cleaner with high efficiency and minimal obstruction to air flow, to eliminate the necessity of a forced air supply, are adequately met by a simple apparatus first suggested by Drinker (*1*). Such a precipitator, based on the principle of ionizing and precipitating foreign bodies in a strong electric field, has an air-cleaning efficiency of better than 98%. As used, it consists of two Pyrex tubes of 34 mm ID and 45 cm long, wrapped with aluminum foil and lacquered, with a stiff hay-binding wire mounted in the axis of each. A 15,000-v a-c source[2] is connected between the wire and the foil. Care must be used to provide protective shielding and insulation for the high-voltage circuit. This can be done most conveniently by placing the transformer near the tubes, thus shortening the high-voltage leads and enclosing the entire assembly in a wooden cage under the work-desk. In addition, the distance between the foil or center wire and the metal conduit must be at least 3 cm, to prevent sparking to the machine. Even with this distance the Pyrex tube and the glass wire support must be perfectly dry. The efficiency of the air-cleaning system can be judged from the absence of yellow flashes from the flame and from the appearance of the tubes after the apparatus has been working for some weeks: the distal 2″–3″ of the tube is coated with grime, the remainder perfectly clean.

The air chamber and precipitation tube interfere markedly with the free supply of air to the burner, even to the point where there is incomplete combustion of the propane, with the consequent appearance of zones of incandescence in the flame. This difficulty was overcome by building into the chimney a baffle plate (Fig. 1) which occludes the gap between the burner and the chimney, above the air holes in the former, deflecting through the burner air that would otherwise flow around it.

We have also found it necessary to decrease the width and height of the windows in the chimney through which light reaches the photocells; possibly because of a decrease in the width of the flame caused by the structural alterations we have made, the edge of the flame sometimes presented at one or another of the windows, leading to irregularities in the amount of light reaching the cells.

With these modifications, we have an instrument whose reliability and convenience are equal to those of the unmodified machine but which can be used without interruption, even in the presence of ordinary room air contaminants. The standard readings are reproducible for several hours, and the galvanometer is free of distracting fluctuation.

Reference

1. DRINKER, P. *J. Ind. Hyg. Toxicol.*, **14**, 364 (1932).

Manuscript received September 26, 1951.

[2] A commercial neon light transformer of 15,000-v, 30-ma output is adequate for at least 3 such tubes connected in parallel.

A New Reaction and Color Test for Allethrin and Pyrethrins

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We wish to give a preliminary account of a new reaction and color test for allethrin and pyrethrins. Allethrin (*1*) is a synthetic insecticide of a structure similar to that of the pyrethrins and is used in insecticide sprays and aerosol bombs to replace the natural pyrethrins. Either pyrethrins or allethrin, but not pure allethrolone or chrysanthemum monocarboxylic acid, gives the reaction.

We have found that a solution of 2-(2-aminoethylamino) ethanol (Eastman's organic chemical, No. 4774, hydroxyethyl-ethylenediamine) in ethanol and alcoholic potassium hydroxide will give a red or violet color with pyrethrins or allethrin if sulfur is added. Without the addition of sulfur, allethrin does not give this color and pyrethrins appear to give only an orange color. The addition of sulfur to the pyrethrin orange reaction mixture causes a red or violet-brown color to form. Pure pyrethrins themselves may not react unless sulfur is present, but every supply available at present has reacted to give the orange color before the addition of sulfur.

The mechanism of the reaction is not known. It appears, however, that certain conditions must be met to cause the color reaction. Morpholine and other amines can take the place of 2-(2-aminoethylamino) ethanol and other alkalies can substitute for potassium hydroxide, but sulfur, amine, alkali, and allethrin (or pyrethrins) must all be present for the color formation. The presence of ethanol aids the reaction. If sulfur is added as a solution in carbon tetrachloride, it is necessary to have a definite quantity present, since the addition of this solution dropwise causes a deeper and deeper color until a maximum is reached. Pure allethrolone, allethrolone semicarbazone, chrysanthemum monocarboxylic acid, and pyruvic aldehyde do not react under the conditions present. Impure allethrolone does give a red color even without sulfur. It is thought that this may be due to furan derivatives that may be formed in the cyclization process, since 2-methyl furan, furfural acetone, and furfuryl acetone give red colors without the addition of sulfur to the reaction mixture.

Under one set of conditions (without the addition of sulfur) 2 mg of natural pyrethrins gave a color reading of 35 in 12 min on the Klett-Summerson colorimeter, using the 44 filter. The same quantity of pyrethrins with sulfur present gave a reading of 277, and a like quantity of allethrin (with sulfur present), a reading of 269.

A number of substitutes for sulfur have been tried in the reaction. The addition of sodium sulfide to potassium hydroxide, ethanol, and 2-(2-aminoethylamino) ethanol gives a dull blue color that is not changed by the addition of allethrin. The addition of sulfur to this mixture causes the reaction to take place and a red-brown color to appear. Thiophene likewise cannot substitute for sulfur.

We have found the following reagent mixture satisfactory: To 25 ml 2-(2-aminoethylamino) ethanol we add 50 ml ethanolic potassium hydroxide (5 g 86% potassium hydroxide is dissolved in 100 ml ethanol and the faint cloud is filtered off through glass wool). To this mixture we add 425 ml ethanol and shake thoroughly to mix. If we add to 2 ml ethanol containing at least 2 mg allethrin or pyrethrins, 8 ml ethanol, 5 ml of the above reagent mixture and 10 mg sulfur, the color reaction occurs.

Reference

1. SCHECHTER, M. S., GREEN, N., and LAFORGE, F. B. *J. Am. Chem. Soc.*, 71, 3165 (1949).

Manuscript received October 15, 1951.

Spraying of Particulate Suspensions Containing Infective Materials for Electron Micrographic Analysis[1]

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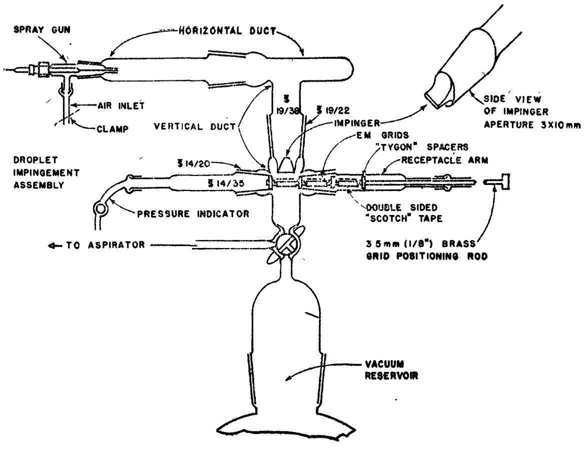

FIG. 1. Spray apparatus.

Applications of a representative droplet field method (*1*) for examining particulate suspensions by electron microscopy have indicated its usefulness for the absolute assay of viruses (*2*) and for comparative studies on the composition of suitable preparations (*3*). A limitation of the method has been its inapplicability to the examination of pathogenic or noxious materials because of the production of an unconfined aerosol. A method has been devised that overcomes this limitation and at the same time permits the use of micro volumes of relatively dilute solutions. The method employs a self-contained apparatus of convenient size which, following an initial evacuation, can be maintained under reduced pressure during the entire operational sequence of introduction of several samples, spraying, and removal of exposed specimen grids. The sample volume needed for producing an adequate number of droplet patterns for observations over the limited scanning area of the universal model RCA electron microscope is about 10 λ.

The device shown in Fig. 1 may be described in terms of three functional parts: (*a*) a 5-liter evacuated reservoir with a suitable valve for evacuation and regulation of the spraying unit, (*b*) a spray gun, and (*c*) an arrangement for droplet collection by impingement on specimen grids. In operation the apparatus is assembled and evacuated by water aspirator with the stopcock fully open. During evacuation the side arm of the spray gun remains clamped off, and the inlet end of the capillary insert is kept sealed (the sample inlet end of the capillary insert is flame-sealed during fabrication and severed to admit samples for spraying). On completion of evacuation the cock is turned through 180° and the pump connection removed. The apparatus may now be moved to a hooded area or to the vicinity of an autoclave if decontamination subsequent to spraying is contemplated.

The spray gun, shown in detail in Fig. 2, is designed to operate with the simultaneous admittance of liquid sample and air dispersant through their respective orifices into the reduced pressure area of the duct. The gun envelope orifice is made as small as practicable, since its size largely determines the rate at which the internal and external pressures equalize. In order

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[2] The author expresses his appreciation of the encouragement and counsel of Robley C. Williams of this laboratory.