Temperature records are obtained by means of a toluol-filled thermometer suspended at the side within the chamber. This necessitates raising the lid and the thermometer in order to read the latter, but this has not been found to be very inconvenient and if quickly done accurate reading can be obtained.

It has been found that sufficient agitation of the liquid is ordinarily produced by the immersion of the warm cans into the very cold denatured alcohol. Agitation of the liquid can be increased by dropping small pieces of solid carbon dioxide into the liquid at the corners of the chamber. By the use of a suitable shaft and rotating clamp connected to a small motor, outside the box, mild agitation of the can contents may be provided during exposure to the very low temperatures.

In order to obtain very low temperatures in the chamber, it has been found best to load the two copper boxes during the evening preceding the day of use. The temperature drops rapidly in the liquid and it is possible to have −20 to −40 degrees F. within a few hours, but the temperature seems to become better stabilized if overnight cooling is employed, and of course, a much lower temperature level finally is reached.

With constant use, it is found that about seventy-five pounds daily of solid carbon dioxide suffices to keep the temperature of the liquid at very low levels, and of course lesser amounts suffice, as the operating temperatures are raised.

The writer was assisted in the design and construction of this freezing apparatus by Mr. C. M. Romaine, of Heiser's, Inc., Seattle, Washington.

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CELLOPHANE MEMBRANES FOR TAMBOURS

THE writer has been using a Cellophane membrane on a pneumatic recording tambour for several months and finds it very satisfactory. It seems to be at least as sensitive as the usual rubber membrane and is much more durable. The original membrane has been in daily use, recording the breathing of white rats, and is still airtight, despite much rough handling.

The Cellophane removed from cigarette packages is of the correct thickness (.001 inch) for low pressure systems. Before mounting, it should be softened by brief immersion in warm water. It may then be fastened to the tambour without danger of cracking, and secured with thread or rubber bands. Rubber cement may be used to seal the edges. If the membrane is not sensitive enough, it may be stretched by forced inflation of the tambour. A light rubber band, stretched over the writing arm near its fulcrum, will insure positive action. The sensitivity of the membrane is determined chiefly by the amount it is stretched, but the thickness of the membrane and the tension of the rubber band have some influence. This type of membrane is very sensitive in its middle range, but will stand surprisingly high pressures without damage. It continues to record at high pressures, but with decreased amplitude. This characteristic is a great advantage where sudden large variations in pressure are frequent, for it prevents the writing point from fouling other markers or leaving the recording surface. This graded sensitivity, together with its relative freedom from deterioration, makes the Cellophane membrane extremely convenient for pneumatic recording.

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SPECIAL ARTICLES

X-RAY STUDIES OF VERY COMPLEX MIXTURES OF LONG CHAIN COMPOUNDS

IT has been reported in a preliminary note[1] that solid solutions may be obtained by mixing pure fatty acids of considerable variation of chain length. This is true for any number of components. In the x-ray studies of such mixtures spacings are observed which correspond to an "average" chain length. Such results are in conflict with the general opinion.

However, we have completed this investigation in every detail, and publication (F. B. Slagle and Emil Ott) will follow shortly.

[1] Emil Ott and F. B. Slagle, *Jour. Phys. Chem.*, 37: 257, 1933.

Due to the importance of these results in connection with the interpretation of x-ray diagrams of high-polymers of a chain-like structure it seemed imperative to extend such studies to other types of long chain compounds, the results of which are briefly reported here.

The following equimolar mixtures of normal alcohols were studied: the nine alcohols C_{10} to C_{18} and the six alcohols C_{13} to C_{18}. Complete solid solution formation is evident in both cases, since only one crystal spacing (in various orders) in the direction of the c-axes is observed. Inasmuch as the usual modification of the alcohols has the chain axes perpendicular to the base it is possible in this case (con-

trary to the case of the fatty acids) to find out what the meaning of the composite spacing is. Calculations show that it corresponds within the experimental error to the arithmetical average of all the components. It is probably justified in other cases to consider the spacing of the mixture also as average, provided the proper modification of the substance is considered.

Solid solution was also observed in the mixture of the normal paraffines C_{19}, C_{24}, C_{32} and C_{36}.

Since solid solutions of chain compounds may be obtained with such large relative changes in chain length it might be anticipated that the variation of the nature of end groups, provided the general shape of the molecules is the same, would not interfere with the solid solution formation. With this in view the approximately equimolar mixtures of the following substances were studied: (a) C_{18} acid, C_{18} acetate, C_{18} bromide and C_{19} hydrocarbon and (b) the ten normal fatty acids C_{10} to C_{19}; the six normal alcohols C_{13} to C_{18}; the two normal bromides C_{17} and C_{18}, the three normal acetates C_{16} to C_{18} and the four normal hydrocarbons C_{19}, C_{24}, C_{32} and C_{36}. In each case only one phase, with one definite crystal spacing in the direction of the chain axes (indicated to the fifth order), was obtained.

It appears to us, then, that it is safe to say that in general long chain compounds of quite a variation of length and type will form solid solutions. Also, it is possible, in spite of the complexity of such mixture, to observe average chain lengths in an appreciable number of orders. It appears, therefore, that it should be possible to obtain a similar effect in certain high polymers. In general, this has not been observed; however, there exists one piece of work dealing with this effect.[2]

In view of the results mentioned above, its reality can not be doubted any longer.

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MUCIFICATION OF THE VAGINAL EPITHELIUM OF IMMATURE MICE FOLLOWING INJECTIONS OF FOLLICULAR FLUID

HARRIS and Newman[1] proposed a test for the potency of extracts of corpora lutea based on the appearance of mucus-like cells in the vaginal epithelial of the adult mouse. Meyer and Allen[2] disputed the validity of this test because they were able to produce mucification in castrated rodents with dilutions of amniotin and theelin.[3] Both of these substances are commercial products standardized for the oestrogenic hormone. Harris[4] later pointed out that when "normal" instead of castrated mice were used he was unable to produce vaginal mucification. He concluded that "the injection of an oestrous preparation into otherwise normal mice does not bring on mucification of the vaginal epithelium."

In order to settle the point at issue, immature mice were injected with follicular fluid aspirated from the sow's ovaries. The sow's ovaries were obtained the day the animals were slaughtered, kept on ice and used the following day. Six injections of 0.2 cc each, given at six-hour intervals on two successive days, were administered to all the animals which lived over twelve hours.

The mean age of the first oestrus of the animals in this colony was 30 days, S.D.M. 0.5. All the experimental animals were killed at a mean age of 18 days, S.D.M. 0.5. Mirskaia and Wiesner[5] have shown that mucification may develop six days before the first oestrus. By killing the animals at an average of twelve days before the first oestrus, the mucification normally found prior to the first oestrous smear should have been avoided. The immaturity of the animals at death was also attested by the condition of the ovaries. In none of the ovaries of the seventeen animals examined were mature follicles or corpora lutea present.

Twenty animals in all were injected. They were killed twelve to seventy-two hours following the first injection. Sections were made of the vagina, uterus and ovaries. The vaginas from the four mice killed twelve hours after the first injection showed mucus like epithelial cells at the distal portion. The upper part of the vagina was closed. Five vaginas examined twelve hours later were found to be patent throughout. The epithelial border was wider than in the first group, the peripheral mucoid cells showed vacuolization. Two animals killed at thirty-six hours showed the mucoid vaginal cells higher and more vacuolated with cornified cells forming beneath. Three animals killed at forty-eight hours showed about the same picture as seen in the twenty-four

[2] Emil Ott, SCIENCE, 71: 465, 1930. *Z. f. phys. Chem., B, 9,* 378, 1930.

[1] Reginald G. Harris and Dorothy M. Newman, "A Practical Test for Potency of Extract of Corpora Lutea," SCIENCE, 74: 182, 1931.

[2] Roland K. Meyer and Willard M. Allen, "The Production of Mucification of the Vaginal Epithelium of Rodents by the Oestrus Hormone," SCIENCE, 75: 111, 1932.

[3] Theelin prepared by Parke, Davis and Company; amniotin prepared by E. R. Squibb and Sons.

[4] Reginald G. Harris, "Mucification of the Vaginal Epithelium of Mice as a Test for Pregnancy-Maintaining Potency of Extract of Corpora Lutea," SCIENCE, 76: 408, 1932.

[5] L. Mirskaia and B. P. Wiesner, "On the Occurrence and Mechanism of Prepuberal Mucification." Proc. Second International Congress for Sex Research, 408, 1931.