tion when *white light* is used than films corresponding to minima of higher orders for which $a = 1, 2, \ldots$ etc.

Built-up films of the soaps of fatty acids[4, 5] have provided a substance which can be treated in such a way as to have the value of refractive index which is required by Eq. (1) for the case of ordinary glass ($n_g = 1.52$) or for any glass of higher refractive index. The films are unfortunately soft and can be wiped from the glass with a cloth. However, they provide an extraordinarily useful tool for studying the application of the phenomena of interference to problems of light reflection.

The substance of which a built-up film is commonly composed is a mixture of a fatty acid and of the soap of a fatty acid. Thus the composition of Y-films of so-called "barium stearate" is about 50 to 80 per cent. barium stearate, and the remainder is stearic acid. When films of this substance are soaked in a solvent for stearic acid, the film is left as a skeleton of barium stearate, with air filling the spaces previously occupied by the stearic acid.

If a film has initially a refractive index $n_1 = 1.50$, and if 50 per cent. of the material is removed without causing the film to shrink in thickness, the refractive index of the skeleton is 1.232. This is the value of n_1, which serves to extinguish the reflection of light from glass $n_g = 1.518$; that is, from glass of the type of ordinary window glass.

Skeleton films can be built of cadmium arachidate, which are better in optical quality than those built of barium stearate. The films are built by spreading arachidic acid in a monolayer on the surface of a bath which is 10^{-4} M cadmium chloride, 10^{-3} M sodium acetate, 1.2×10^{-4} M HCl, pH 5.7. They are built to the desired thickness on both sides of a plate of glass by the ordinary methods used in making built-up films. The thickness of a film having 42 or 44 layers of skeletonized cadmium arachidate is a quarter wave-length of sodium light. The built-up film is soaked for about 2 minutes in alcohol, and then in acetone at 35° C–40° C until the refractive index has decreased to the extinction value.

A film built in this way completely extinguishes the reflection of sodium light, and nearly extinguishes all visible light of other wave-lengths. When a plate of ordinary glass is placed a few inches from a 6,000-lumen sodium vapor lamp, with a black background behind the plate, the glass reflects a bright glare of yellow light, whereas if the glass is coated with a non-reflecting film the coated area appears as black as black velvet. A stripe of this type of film, built on a plate of glass, increases the transmission of light from 92 per cent. for clean glass to 99.2 per cent. for the film-coated glass. When one looks through the glass at the sky or at a sheet of white paper, the stripe has the appearance of clean glass, and the clean glass on either side of the stripe appears to be slightly smoked.

The difference in reflection is particularly striking in the case of the type of glare which prevents an observer from seeing objects which are behind a glass window. For example, one half of the glass cover of an instrument meter was coated with a non-reflecting film, and the contrast between the coated half and the uncoated half was so striking that observers seeing this instrument for the first time were deceived by the illusion that there was no glass on the film-coated half.

A paper describing the full details of this work will be published in the near future.

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CITY AIR SEARCHED FOR SULFUR FUMES

RESULTS of a 15-month survey to determine the *average* amounts of sulfur gases in the air of American cities, long a subject of speculation and dispute, are announced by Air Hygiene Foundation and Mellon Institute. The average amounts of sulfur fumes found in 25 cities studied were comparatively small.

More than 50,000 separate air tests were made by six chemists driving a fleet of cars equipped like "traveling laboratories." They canvassed industrial and residential centers throughout the East, South and Midwest, from August, 1936, to October, 1937. Most of the tests, covering all hours of day and night and all seasons of the year, were made in five metropolitan districts. The five, in the order of their sulfur dioxide pollution, are given in Table 1 (figures indicate parts of sulfur dioxide per million parts of air).

TABLE 1

City	Within 15-mile radius of center of city	
	Average	Maximum
St. Louis—East St. Louis ...	.128	2.266
Pittsburgh	.057	.897
Detroit	.028	.396
Philadelphia—Camden	.027	.424
Washington	.009	.290

The above figures are of no significance from a public health standpoint, according to hygienists connected with the investigation. That is, "in the concentrations found, the contaminants do not exert harmful physiological effects."

The survey showed that the home fires are among the large contributors to sulfur pollution, particularly in districts using coal of high sulfur content. The type of coal burned in a locality was mirrored in the results of the study. The fuel factor also explains why sulfur pollution in most districts was approximately 50 per cent. higher in the "heating season" than in the summer months. Some industrial operations also discharge sulfur fumes, unless properly safeguarded.

A close relationship was found between wind velocity and the amount of sulfur dioxide in the air. The higher the wind the cleaner the air. Fogs catch and "store up" the sulfur fumes. Some of the highest concentrations were noted on foggy nights.

Occasional tests were made in a score of other cities. Dr. H. B. Meller, managing director of Air Hygiene Foundation, cautioned that results obtained in these cities can not be compared with the findings for St. Louis, Pittsburgh, Detroit, Philadelphia-Camden and Washington. He pointed out that "only a few tests were made in this group, not enough to arrive at a typical, average figure, as in the case of the five centers which formed the backbone of the survey." Results for the 20 other cities are given in Table 2.

TABLE 2

City	Summer average	Winter average
Baltimore	.021	.081
Chicago	.067	.091
Cleveland	.064	.081
Wheeling	.070	...
Nashville	.028	.093
Cincinnati	.021	.064
Buffalo	...	.044
Youngstown	.049	.026
Louisville	.022	.041
Ft. Wayne	.028	...
Richmond	.009	.047
Indianapolis	.023	...
Toledo	.023	...
Chattanooga	.011	.035
Springfield, Ill.	.021	...
Birmingham	.017	.017
Charlotte, N. C.	.015	...
Johnstown	.014	...
Harrisburg	.011	...
Atlanta	.012	.032

J. D. Alley directed the field work and compilation of data. Dr. J. L. Sherrick was in charge of the chemical laboratory. Both were fellows on the Air Hygiene Foundation Fellowship at Mellon Institute. Six chemists were employed in the field. One operated a "rover" laboratory, visiting a score of cities. The others were stationed in the five metropolitan districts described.

Each of the five field men traveled a prearranged route, covering about 130 designated stations in each of the five districts. The stations were scattered through business districts, parks, industrial sections and residential neighborhoods, and ranged from the center of a city to 25 or 30 miles in the suburbs. This was done to determine the *average concentration* rather than temporary "peaks" and "lows."

The field chemists worked a "staggered" schedule, 8 A.M. to 4 P.M., one week, 4 P.M. to midnight the next, etc. Their day off was also rotated. Thus over a period of 15 months they obtained comprehensive checks on sulfur concentrations for each hour of the 24, each day of the week and each season of the year.

JOHN F. MCMAHON

THE NATURE OF THE CARBOHYDRATE IN THE GONADOTROPIC SUBSTANCE OF PREGNANCY URINE

THE presence of carbohydrate in gonadotropic hormone preparations from pregnancy urine has been observed by numerous investigators. Fischer and Ertel[1] have stated that the properties of their relatively crude material agreed closely with urinary mucoid and ovomucoid, while Meyer,[2] working with highly active preparations, also characterized the hormone as a mucoid. Hartmann and Benz[3] have very recently reported studies of the carbohydrate of their APL hormone preparations, but were unable to decide whether their material contained mannose, galactose or a mixture of both. They published no details regarding the purity of their product.

By a process which will shortly be published in detail, hormone preparations have been made assaying 1,000 to 3,000 units per milligram by the Friedman rabbit assay method. These fractions contain carbohydrate, hexosamine and acetyl groups[4] as previously found by Meyer[2] in his preparations. Pentose, ketohexose and uronic acid were shown to be absent.

Our early determinations[4] of reducing sugar by the Hagedorn-Jensen procedure gave values that were too high as a result of errors produced by the accompanying products of protein hydrolysis. Clarification with $Zn(OH)_2$ did not materially lower the figures. Similar errors have been observed by Mundy and Seibert[5] as well as Hewitt.[6] The Shaffer-Hartmann method, however, yields lower results.

Using suitable methods we have obtained evidence to indicate that our purest preparations contain 2 hexose groups for each hexosamine. Assuming that the carbohydrate in the hormone is composed of trisaccharide units containing 1 hexosamine and 2 aldohexose groups, we have compared two of our best preparations with the commonly occurring aldohexoses by means of the carbazole[7] and orcinol reactions.[8]

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