Cornell University Medical College, New York City. The accomplishment of a given amount of mechanical work is always at the expense of a given amount of energy and the amount of energy required for the mechanical work is independent of the physical condition of the subject and of the quantity of carbohydrate present in the gastrointestinal tract.

Report of the annual meeting: Award of medals, research grants from the trust funds.

Edwin Bidwell Wilson
Massachusetts Institute of Technology,
Cambridge, Mass.

SPECIAL ARTICLES

NOTE ON THE SWELLING OF GELATINE AND AGAR GELS IN SOLUTIONS OF SUCROSE AND DEXTROSE

The tests reported in this note were made incidentally in connection with experiments by D. T. MacDougal[1] on the swelling of cactus tissues (*Opuntia*) and of certain artificial gels in water and in dilute solutions of acids and alkalis. The method was the same in all particulars as that described by MacDougal. Small plates cut from thin, dried sheets of the various gelatine-agar mixtures were placed in the sugar solutions and the increases in thickness which occurred as these plates imbibed water and swelled were measured by the auxograph. The experiments were at room temperature, which ranged between 60° and 70° F. (16° and 21° C.). In all cases the gels were the identical preparations used by MacDougal. The sucrose was the usual "c. p." grade. The dextrose was Merck's "highest purity." The sugar solutions were tested for neutrality to phenolphthalein and litmus. Sugar concentrations are in percentages by weight.

The results are given in the following tables as percentage increases in thickness of the gel plates after approximately 12 hours in the respective solutions. The original thicknesses were measured by a micrometer gauge. Preliminary tests for longer time periods indicated that the swelling was always complete or very nearly so, in 12 hours. In the tables, figures on a single horizontal line represent tests made at the same time and under substantially identical conditions, the only differences being between the concentrations of the sugar solutions.

EXPERIMENTS WITH SUCROSE

Gelatine (without Agar)

Distilled Water	0.5% Sucrose	2% Sucrose	5% Sucrose	25% Sucrose	50% Sucrose
250	315				
250	250	210	260	210	
Gelatine 100—Agar 1					
630	670				
620		710	550	520	330
Gelatine 80—Agar 20					
300	350				
550		400	450	500	250
Gelatine 50—Agar 50					
875	850				
600		525	500	450	275
Gelatine 20—Agar 80					
1,150	1,050				
1,100		1,375	1,150	1,175	425
Agar (without Gelatine)					
825	733				
1,000		1,175	900	700	350

EXPERIMENTS WITH DEXTROSE

Gelatine (without Agar)

Distilled Water	2% Dextrose	5% Dextrose	25% Dextrose	50% Dextrose
260	310	240	210	210
Gelatine 80—Agar 20				
300	450	400	500	375
Gelatine 50—Agar 50				
625	525	400	375	350
Agar (without Gelatine)				
1,200	1,175	900	725	500

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[1] Science, N. S., Vol. XLIV., pp. 502–505, 1916.

For the sugar solutions having concentrations less than 25 per cent. the results do not differ from the results for distilled water more than is explainable by the accidental variation normal to the method when the temperature is not controlled precisely. The effects of one hundredth normal acid and alkali found by MacDougal were many times the variations here observed and one may conclude that neither sucrose nor dextrose, in concentrations under 25 per cent., has any important effect on the swelling of gelatine-agar gels in water; important, that is, in comparison with the effects of acids or alkalis. With sugar concentrations of 50 per cent. the data show a markedly lessened swelling of all the gels in sucrose and of the two low-gelatine gels in dextrose. It may be that the two high-gelatine gels also swell less in 50 per cent. dextrose but the decrease is not certainly determinable from the single test which was made. This decrease in swelling in concentrated sugar solutions is to be expected from analogy with the osmotic behavior of such solutions and does not indicate any specific effect of either sugar on the swelling or imbibition capacity of the gels themselves.

E. E. Free

Desert Botanical Laboratory

THE AMERICAN CHEMICAL SOCIETY

III

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

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A new method of separating zinc from cadmium and the latter's determination iodometrically: Eric John Ericson. The separation consists in crystallizing the zinc out as zinc sulphate or zinc ammonium sulphate. It may be applied to the determination of cadmium in ore or in spelter (after removing and determining lead). In the latter case, although a small trace of cadmium is entrained in the crystals, only one crystallization is deemed necessary in view of the large sample taken. After removal of zinc, the cadmium may be determined by any of the usual methods. An iodometric method is outlined.

The determination of cadmium in brass: E. Schramm. Owing to the lack of any well-tried method for the determination of cadmium in brass, a series of analyses was carried out on brasses and on mixtures of salts with and without additions of cadmium. A procedure was developed which gives fairly reliable results for the small amounts of cadmium concerned. The method consists essentially in removal of the copper electrolytically from nitric acid solution, followed by separation of the cadmium from zinc with hydrogen sulphide, in solutions of regulated acidity and small volume. The cadmium is finally weighed as sulphate.

The electrometric titration of zinc: F. Russell v. Bichowsky. In the potassium ferrocyanide method for determining zinc there are three principal sources of error: (1) Oxidation of the ferrocyanide by any nitric acid, chlorine, or bromine present; (2) precipitation of other metals along with zinc; (3) uncertainty of the end point. To remove the first source of error precautions such as the addition of SO_2 should be taken. To avoid the precipitation of other metals the rational procedure is to change the conditions of the ferrocyanide precipitation by carrying it out in solutions containing from 10 to 20 per cent. HCl. In these solutions zinc ferrocyanide is only slightly soluble, but lead, manganese, iron and copper ferrocyanides are very soluble. Since the ordinary indicators can not be used at this concentration of acid, an electrometric determination of the end point is adopted, which is found to be quicker and more accurate than the older methods. This consists in noting the point at which there is a sharp change in potential of the solutions against a platinum electrode. The apparatus is the same as that used in determining the end-point of oxidation and reduction reactions in the analysis of iron, vanadium, chromium, etc. Experiments on a number of salt mixtures show that the end point is not affected by the amount of acid or neutral salts present within reasonable limits, nor by the presence of iron, lead, manganese (up to 50 mg.), or by small amounts of copper and cadmium. The preliminary operations for the purification of the ore therefore lose their customary importance; comparative results show that the electrometric method is more rapid than the usual procedure.

The vapor pressure of zinc and related metals: John Johnston. A review of the somewhat scattered observations on the vapor pressure of high-boiling metals, and a reduction of the data yielding equations by means of which the vapor pressure at any temperature can be ascertained. Published observations on the volatility of metals, alone and from mixtures, are also summarized.