

pose, for instance, that *A* and *C* are very soluble in each other, more so than the other pairs; that is to say, that *A* and *C* have an attraction for each other, which we may call physical, but it would have the effect of restraining the molecules of these two substances, so to speak, from taking part in the reactions as they otherwise would, and hence diminish their effective concentrations. While the mass law probably holds absolutely in ideal cases, in actual cases we expect only approximations such as we find with the gas law when actual cases are considered.

The effect of isomerism, in the acids, on the limit found with mercaptans and the three toluic acids was worked out by Sachs and Reid.<sup>1</sup> These authors found that the limit with ethyl mercaptan was practically the same with the *o*-, *m*-, and *p*-toluic acids. The results obtained above with alcohols, however, show a variation in the limit. With methyl alcohol the limit rises from ortho, meta to para, while with ethyl and propyl alcohols the reverse is true. This exceptional behavior of methyl is also observed in the high value of the limit with benzoic acid.

#### Conclusions.

1. Esterification limits have been found for benzoic and the three toluic acids with methyl, ethyl and propyl alcohols.
2. The limits found vary only slightly with change of ratio of active masses, that is, the mass law holds very nearly.
3. With the exception of methyl alcohol the esterification limit rises with increase of molecular weight of the alcohol.
4. With methyl alcohol and the toluic acids, toluic acid shows the highest limit, *o*-toluic acid the lowest.
5. The reverse is true of ethyl and propyl alcohols and the toluic acids.
6. These acids have been found to be esterified very slowly by alcohols even at 200°, four days being required to reach the limit.

BALTIMORE, MD.

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#### NEW BOOK.

**Charles Anthony Goessmann.** Published Jointly by the Corporation and the Associate Alumni of the Massachusetts Agricultural College; printed at the University Press, Cambridge, Mass., 1917.

A beautifully printed brochure from the Riverside Press at Cambridge, lies open before me. I see the impressive frontispiece—the portrait of Goessmann, in his prime. I look at the dignified features of one of the Big Four of the early Agricultural Chemists of the country, Johnson, Storer, Hilgard, Goessmann! Who of their successors will do more for agricultural science than they have done? Goessmann had a precious opportunity to prepare himself for brilliant work and he embraced it to the fullest extent. He was first a pupil of and for five years assistant to

<sup>1</sup> THIS JOURNAL, 38, 2746 (1916).

Wöhler. He was born at Naumburg, on the 13th of June, 1827, and died at Amherst, September 1, 1910, in his eighty-fourth year. In 1852 he became Doctor of Philosophy at Göttingen and was immediately made assistant to Wöhler. His earlier ambition was to be a pharmacist, and his doctor's dissertation was on "The Constituents of Cantharides." It was Wöhler who persuaded him to devote his life to chemistry. During the five years he was assistant to Wöhler his reputation as an investigator was firmly established. His early connection with agriculture is also noted at this time in the discovery of arachic acid in the peanut. He also, in collaboration with the late Professor Caldwell, discovered hypogaecic acid. His studies of leucin at this time led to the description of the first known amino acid. As a teacher at Göttingen he had among his pupils many Americans, who subsequently became ornaments to the profession, among them—Caldwell, Chandler, Clark, Garrigues, Hungerford, Joy, Mallet, Marsh, Nason, Pugh and Weyman.

Dr. Goessmann gave up his career at Göttingen to enter the field of applied chemistry. He came to America by invitation of the Eastwick Brothers, of Philadelphia, to improve the processes for the refining of sugar. During his whole career he took the deepest interest in all problems relating to that industry. Wöhler was much disturbed at his departure and wrote to Liebig: "Unfortunately I am to lose him, for five years my assistant and known to you through his works." Could any greater compliment have been paid to a young chemist than being regretted by Wöhler?

During his service with the Eastwicks, Goessmann made the first extensive chemical studies of sorghum, as a sugar-producing plant, and it was through these studies that the writer first became acquainted with him. The results of these studies were submitted to Wöhler and were published, after his endorsement, in the *Journal für Landwirthschaft*.

It was just at this time (1858) that a few seeds of sorghum were sent by our Congressman to my father, who turned them over to me. I planted them and in the autumn, expressing a small quantity of juice by torsion, made my first experiment in the manufacture of sorghum sirup.

From the refining of sugar Goessmann was called to another important agricultural problem, *viz.*, making salt for butter. As long as a deranged taste leads us to prefer a salty butter, it is well to have the pure salt.

While at Syracuse he was appointed professor at the Rensselaer Institute, at Troy, at the request of Professor Chandler and served there for two years.

During the Civil War (why Civil?) Goessmann was proposed by Wöhler for the professorship of Chemistry in the Braunschweig Technical High School. He wrote to Wöhler that the political affairs of this country were so mixed that little hope for the future was promised. He, therefore,

was greatly pleased at the prospect of returning to so promising a post in his fatherland. For some reason this plan, fortunately for this country, was never carried out and Goessmann was saved for his great work at the Massachusetts Agricultural College.

He accepted this post on May 16, 1868. At this time he was forty-one and is described by President Clark as a "hearty, full-blooded, wide-awake, nervous German. I will not compare him to Agassiz, but I will say that he is a man of temperament something like his." At the same time Agassiz wrote: "I know of his work as a scientific chemist and I do not believe you could have had a better appointment. It is not a very dangerous thing to take professors from foreign parts. I am such an one and have in a measure succeeded in making myself a native American." So did Goessmann. So have done, thank God, so many of our foreign-born citizens. At Amherst, Goessmann continued his studies with sugar-producing plants, but this time with a more promising subject than sorghum, *viz.*, the sugar beet. With seeds obtained from Germany, he continued the experimental work with sugar beets, begun in this country in 1835 and spasmodically continued to 1884. He contributed freely to *The American Chemist*, founded by Professor Chandler, in 1870.

Becoming a member of the State Board of Agriculture, in 1873, he published a paper on commercial fertilizer which had for its *leit motif* the slogan—"to state what they sell and sell what they state." This secured the passage, by the State of Massachusetts, of the first fertilizer control act in this country.

His work in agriculture from that time to his death is an integral part of scientific agriculture in all the states. Notable particularly are the establishment of the silo, the promotion of the sugar industry, the chemistry of fruits, scientific feeding experiments, and the economical use of fertilizers.

Of particular interest to agricultural chemists is the fact that Goessmann was the Maecenas, *pater carissimus*, of the Association of Official Agricultural Chemists. At a meeting of agricultural chemists held in Washington in 1880, he offered the following resolution:

"Resolved, That this Convention form a section in the sub-division of Chemistry of the American Association for the Advancement of Science, and that the next meeting be held in Boston, during the regular meeting of the aforesaid Association."

Although no stable organization resulted from this effort, it at least bore fruit in the organization of the Association in Philadelphia four years later. Since that date the Association has grown steadily in number and influence and now has nearly 300 members. Through its work the science of agricultural chemistry has been placed on a plane in this country higher than in any other country of the world.

Of particular interest to chemists are selections from the correspondence with Wöhler which are given in the last pages of the Memorial. In a letter to Goessmann, dated March 12, 1860, Wöhler announces the discovery of cocaine in the following modest words:

"At present I am having Niemann make an investigation of the famous Coca (*Erythroxylon coca* of Peru) and, as far as we have ascertained, it very probably contains an organic base which may be crystallized and which resembles atropin. We have christened it Cocaine."

Again, under date of August 1, 1866, Wöhler wrote:

"Last month when the king with the whole Hanoverian army and all the munitions of war took refuge here, we were living in a wild, great military camp, daily fearing the outbreak of a battle in our immediate neighborhood. After the departure of our army Göttingen was occupied by the Prussians. Then came the disastrous battle of Langensalza, followed by the capitulation of our army. The Prussians have also been victorious in the south, where they occupy all of Hesse, Nassau, Darmstadt, Frankfurt and a great part of Bavaria. Their troops are already near or in Würzburg. At present there is an armistice. It is said that all of Hanover, the Electorate of Hesse, and Nassau will be annexed to Prussia. But enough of these painful events."

And on December 17, 1868:

"Here everything is going its old course, with some modifications, since we are Prussians."

How pathetic! Dear old Wöhler trying to be a good Prussian! First the rape of Schleswig-Holstein, and then, alas, poor Hanover! Soon the intoxication of Sedan was to come, the stain of which victorious Verdun has washed away.

As a teacher, Goessmann was greatly beloved by his pupils. He was not only their instructor, but their friend and mentor. He had brought with him not only the spirit but the method of his own master at Göttingen. Every one of his pupils was a grandson of Wöhler. Goessmann was a deeply religious man. Born and brought up in the Catholic church, he remained a devout member thereof to the end of his days. He was as reverent in the presence of a fact as Faraday. He was methodic in all his activities and devoid of undue haste to a truly German degree. While one could always detect that he was a foreigner by his speech, he had complete mastery of the English language with his pen, and was a prolific writer on scientific subjects. The titles of 362 papers are given in the Memorial. He loved the quiet and academic repose of his beautiful home at Amherst and in his later days he never even attended the meetings of the Association of Official Agricultural Chemists, of which he was the founder. His first chemical paper was published in 1853, being his dissertation on the components of the Spanish fly. His last

publication was issued in 1907, entitled "Instructions Regarding the Sampling of Materials to be Forwarded for Analysis."

Had Goessmann continued his research work he perhaps might have attained a higher rank among the chemists of the world, but he would not have performed the service to science and to humanity which he did. We are deeply indebted to Frederick Tuckerman, Joseph B. Lindsey and Charles Wellington, the Committee, entrusted with the preparation of the Memorial which they very appropriately prefaced by a translation from the inscription on Fichte's monument in Berlin:

"Teachers shall shine  
As the brightness of the Firmament;  
And they that lead many to truth  
As the stars for ever and ever."

HARVEY W. WILEY.