New Synthetic Methods in Chemistry of Fats

IN the case of fats there are three kinds of synthesis, viz:—Preparation both of fatty acid and glycerine by synthesis; secondly, fats with fatty acids and glycerine, and thirdly, fats and oils are transformed to make products of greater industrial value.

Endeavors have been made to obtain integral synthesis by chlorination of the hydrocarbons of the paraffin series and introduction of carboxyl by the Grignard method. On the other hand paraffin was directly oxidized into fatty acids. These methods have lost interest since the renewal of supplies of natural fats after the war.

The synthesis of fats with fatty acids and glycerine gave interesting results. Glycerine being a trivalent alcohol, mono-, di-, and triglycerides can be made, not only of a single acid, but also of mixed glycerides containing various acid radicals.

The number of derivatives of this order is somewhat great, as the diglycerides and, for greater reason, the triglycerides can exist in several isomers, considering the difference between the third hydroxyl of the glycerine and the two others. These syntheses were specially studied by Grün, who prepared mixed glyceric esters from monohydrochlorine. After esterifying this last with a fatty acid and replacing chlorine with hydroxyl by conversion into a nitroso compound he was able to esterify this hydroxyl with a different acid to the first. Other methods of synthesis of this kind have been proposed by Emil Fischer and Bergmann.

The direct conversion of fats into others of superior quality is much more important than the preceding processes. The principle of this method dates back to Berthelot, who found that triacetin heated with glycerine gives diacetin and monoacetin, the glycerine being esterified at the expense of one of the acid radicals.

By treating fats with an alcoholic hydrochloric solution, fatty esters of the alcohol utilized are obtained. Thus in Germany during the war alimentary fats were made, but their use was on a small scale. It appears that these esters are better than ordinary greases for nourishing leather.

This method for exchange of acid radicals serves particularly to lower the melting point of fats, such as mutton, pressed tallow and certain hardened fats. These fats contain considerable quantities of tristearin-palmito-distearin and certain glycerides of behenic acid (hardened fats). Their high melting point makes them unfit for alimentation. By replacing the higher fatty acids with others of less molecular weight or converting these fats by reaction with glycerine into mono- and diglycerides, their melting point can be lowered. In practice these transformations are made in presence of catalysers. The mono- and diglycerides obtained can be esterified in turn and give fats with mixed fatty acids.

Norman obtained similar results by the action of acids on glycerides. Heating tristearin, for example, with butyric acid butyrodistearin and free stearic acid are produced. Thus special glycerides can be made, those, for example, with an odd number of carbon atoms. Fats of this kind eaten by diabetics are to be found in the market under the name of "Intarvine."

Among the fats, castor oil presents interesting possibilities of new synthesis. It is easily transformed by hydrogenation into triglyceride of 12-oxystearic acid. This glyceride gives, by decomposition, the glycerides of estolides, viz., condensed fatty oxyacids in which the carboxyl of a molecule is esterified by the carboxyl of another. These compounds are usefully employed as special lubricants, and to soften leather, textiles, etc.

Condensation of the fatty acids is already obtained by prolonged heating. Compounds are obtained with molecular weight of 12,000 and, it appears, up to 20,000. Having obtained the acid with the required degree of condensation it is esterified with glycerine.

Grün obtained glycerides of estolides by directly heating the fat in presence of catalysers, like tin, which produce internal esterification. This same author in collaboration with others, succeeded in synthetically producing superior alcohols of waxy nature by treating fatty acids with iron, at a temperature of 360°C., and then heating the ketones thus produced with alcohol and soda lye.

These new methods of synthesis enable manufacture of the best neutral fats from waste fats previously refined by modern methods.—*Rev. Prod. Chimiques.*