Acylglycerols

Acylglycerols can undergo oxidation on their ethylenic FAs, producing compounds that are responsible for the odor and flavor that stale (rancid) fats have.

Physical Properties:

1. Acylglycerols are less dense than water and are water insoluble. In contrast, mono- and diacylglycerols are polar molecules due to their free hydroxyl groups; they have emulsifying power. Triacylglycerols are soluble in chloroform, ether, and hot alcohol. These are all solvents that are used to extract these triaclyglyserols from tissues.

Melting Properties:

2. The melting temperature of an acylglyceride depends on the FAs that compose them. Those containing FAs with long saturated chains melt at higher temperature, while those with FAs that are unsaturated or have short saturated chains melt at lower temperature. For example, tristearin melts at 71°C, while triolein at −17°C.
3. Heteroacylglycerols with unsaturated FAs are either liquid at room temperature or solids with a low melting temperature, depending on the amount of ethylenic FAs present in the molecule. Vegetable oils are rich in triacylglycerols containing long-chain unsaturated Fas.

Chemical Properties:

4. The chemical properties of acylglycerides depend mainly on their ester functions and the FA chains that constitute them.

Hydrolysis:

5. Acylglycerides are also readily cleaved when heated in the presence of a strong base (KOH or NaOH), leading to the release of glycerol and the corresponding FA salts (soaps). This process is called saponification.

Sponification:

6. In addition to triacylglycerols, nonester substances exist in fats. These form the unsaponifiable fraction of fats and include hydrocarbons, free sterols, and pigments. After saponification, compounds with ester functions (acylglycerols) are converted into glycerol and soap, both of which are, unlike the original fat, soluble in water and insoluble in ether.
7. The unsaponifiable fraction of fat remains soluble in ether and insoluble in water, a characteristic that allows for the separation of the two groups of substances.

Hydrogenation:

8. Solid fats are obtained by hydrogenation of oils in the presence of nickel as catalyst. This process is used to produce margarine. The hydrogenation of unsaturated FA from the acylglycerols in oils is only partial, which gives these fats a consistency similar to that of butter.

If the hydrogenation were complete, the fats obtained would be hard. The consistency of butter is due to short-chain FAs, such as butyric and caproic.

9. Margarine has acylglycerols with partially hydrogenated, long-chain FAs and lacks the vitamins that are present in butter.

Oxidation:

10. Acylglycerols can undergo oxidation on their ethylenic FAs, producing compounds that are responsible for the odor and flavor that stale (rancid) fats have.