

NATURAL FATS – EDIBLE AND INDUSTRIAL OILS OF VEGETABLES

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INTRODUCTION

- Oils and fats are triesters of glycerol with higher fatty acids, hence known as glycerides.
- The acid associated with these glycerides are straight chain saturated or unsaturated monocarboxylic acids from four carbon onwards. (generally C-12 to C-22)
- The most common saturated acids being butyric acid , stearic acid and unsaturated being oleic acid, linoleic acid.

DIFFERENCE BETWEEN OILS AND FATS

OILS

- Oils are liquids at ordinary temperature (below 20 degree)
- Oils contain a larger proportion of the glycerides of
 - (a) lower fatty acids
 - (b) unsaturated fatty acids.
- Considerably unsaturated.

FATS

- Fats are semi-solids. (m.p. above 20 degree)
- Fats contain a larger proportion of the glycerides of higher saturated fatty acids having high melting point.
- Highly saturated.

Extraction

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graph TD; A[Extraction] --> B[By crushing]; A --> C[By melting]; A --> D[By extraction with solvents]; D --> E[REFINING]
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By crushing

By melting

By extraction
with solvents

REFINING

PROPERTIES

PHYSICAL –

- Pure fats and oils are colourless, odourless and tasteless. But natural fats and oils possess characteristic odour.
- They are lighter than water and immiscible in it but are soluble in ether, benzene, carbon disulphide etc.
- They have specific melting points, specific gravity and refractive index, hence they can be identified by these oil constants.

PROPERTIES

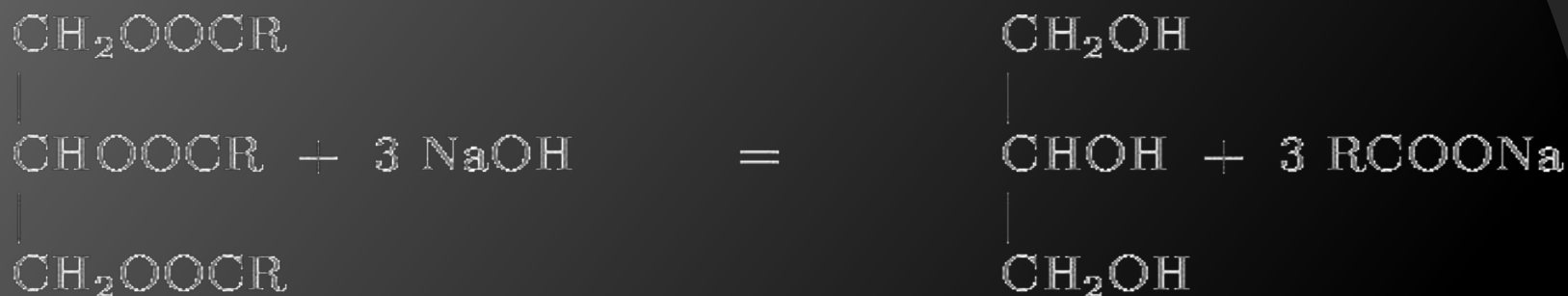
CHEMICAL – Oils and fats are esters, hence they chemically undergo characteristic reactions of esters.

- **Hydrolysis** – (A) *By superheated steam under pressure* : Of about 8 atm at 170`C in presence of lime or ZnO as catalyst.



- (B) *By a mixture of sulphonic acids* – In this method, sulphobenzene stearic acid is used. It hydrolysis the fat at 100`C under ordinary pressure.

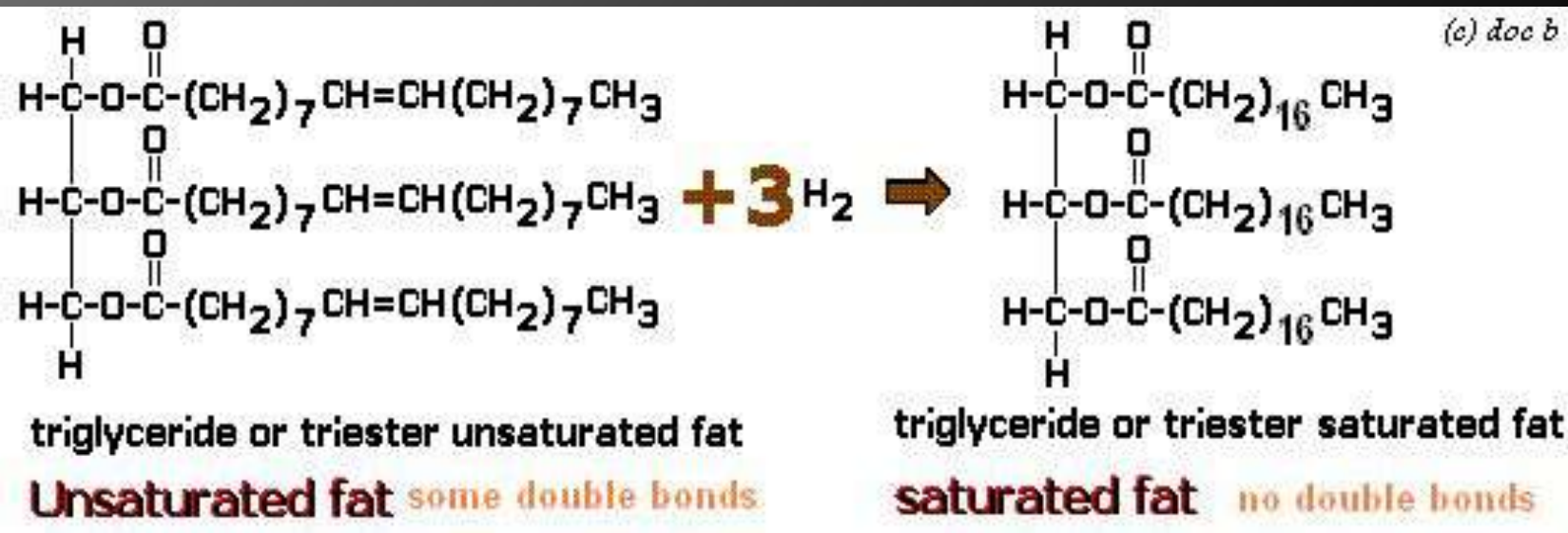
(C) *By heating with alkali (saponification)* – Glycerol and alkaline salt of the acid (soap) are produced. The alkaline hydrolysis is called **saponification**.



(D) *By enzymes* – Enzymes like lipase, when added to emulsion of fat in water, hydrolyses it into acid and glycerol in about two or three days.

Acid obtained by this method is quite pure.

- Hydrogenation** – This reaction is used in manufacture of hydrogenated oils (vegetable ghee)



- Hydrogenolysis** – When excess of hydrogen is passed through an oil or fat under pressure of copper chromium catalyst, glycerol and higher monohydric alcohols are produced.

- Drying of oils

- Certain fatty acids when exposed to air absorb Oxygen and get converted into tough dry transparent mass while some do not.

- Drying oils

- Semi-drying oils

- Non-drying oils

- ◎ **Rancification** – Oils and fats on storage in contact with air and moisture develop unpleasant smell and bad taste.

It is believed that the oil is hydrolysed by moisture producing unpleasant smelling volatile and unsaturated fatty acids. Further, these unsaturated fatty acids are slowly converted into aldehydes of unpleasant smell.

USES OF OILS AND FATS

- As an important food material.
- In the manufacture of glycerine, soaps and candles.
- In the manufacture of vegetable ghee by hydrogenation of oils.
- In the preparation of long chain alcohols obtained by reduction of oils and fats.
- As medicines, eg- castor oil is used as purgatives, cod liver oil supplies vitamins A and D.

INSTRUMENTATION OF VIBRATIONAL SPECTROSCOPY

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ESSENTIAL CONDITIONS FOR THE ABSORPTION OF IR RADIATION BY THE MOLECULE

- 1) Important condition for the absorption of IR radiation by the molecule is that **the frequency of oscillator should be equal or same as the frequency of incident radiations**. If frequencies will differ, molecule will not absorb radiation.

This absorbed radiation increases the vibrational energy of the molecule i.e.; it shall increase the degree of compression and extension.

- 2) The next important requisite is that **the molecule absorbs IR radiations only under the condition that the absorption must bring a change in the dipole moment of the molecule**. If it does not happen, IR radiations will not be absorbed.
- 3) For example :-
HOMONUCLEAR molecules such as N₂, O₂ etc are non polar molecules and do not possess permanent dipole moment.
Their dipole moment is zero . These molecules cannot absorb IR radiations ,consequently no IR spectrum is observed.

INSTRUMENTATION :-

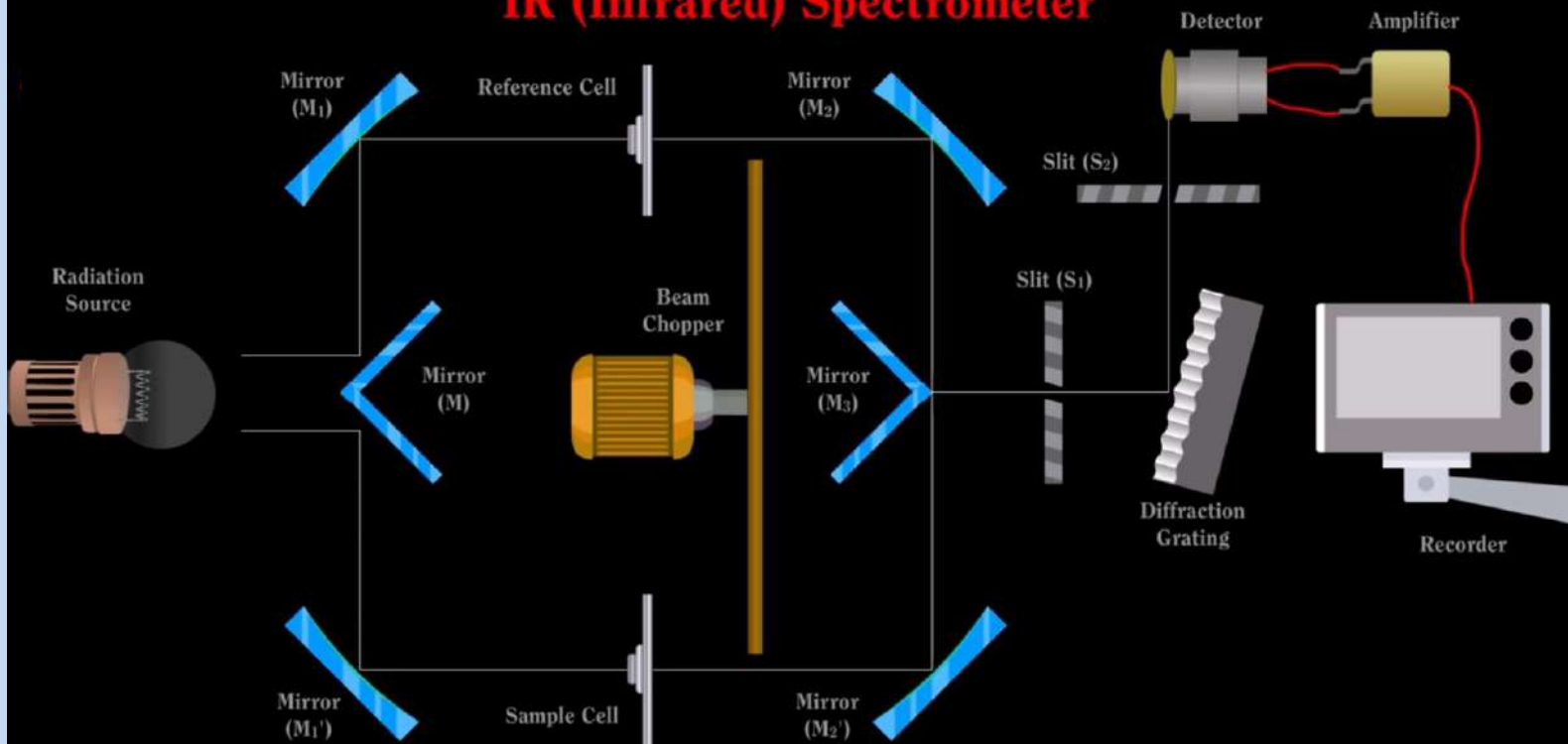
The essential requirements of IR spectrophotometer are the following :

- (1) **SOURCE OF RADIATION** – Heated filament
- (2) **MONOCHROMATOR** – It is used to convert polychromatic radiations to monochromatic one. Instruments with low resolution use gratings as monochromators.
- (3) **DETECTOR** – They are used to measure the intensity of unabsorbed infrared radiation .

Different types of detectors are used ; eg- **photocell**, **bolometers**.

- 5) **AMPLIFIER AND RECORDER** – IR radiation from the source is divided into two beams. These are referred to as the reference beam and sample beam. Both the beams are passed alternately through the monochromator using a rotating mirror. The beams are then passed through the detector.
- 6) When same or equal radiation is transmitted by both the cells, no signal is obtained in the detector. As the sample absorbs IR radiation, inequality of two transmitted beams indicates that the sample has absorbed some radiation and signal is observed. The signals are amplified and the spectrum is recorded.

IR (Infrared) Spectrometer



USES OF INFRA RED SPECTROSCOPY

1. By the analysis of spectrum , functional groups and bonds can be identified.
2. IR spectroscopy measures the vibrations of atoms and based on this it is possible to determine the functional groups.

THANK YOU !!