

Aim - Determination of Iodine Value of Fat or Oil

Principle: Iodine value is a measure of the total number of double bonds present in fats and oils. It is expressed as the number of grams of iodine that will react with the double bonds in 100 grams of fats or oils. Fat or oil contains both saturated and unsaturated fatty acids. Halogens when added across the double bonds of unsaturated fatty acids form additional compounds. Iodine monochloride or monobromide is allowed to react with the oil in dark and the Iodine gets incorporated to the fatty acid chain where double bonds are present. The quantity of iodine consumed is directly proportionate to the number of double bonds present. The amount of unused iodine monochloride or monobromide is determined from iodine liberated on addition of excess of potassium iodide by titrating the sample with standard sodium thiosulphate using starch as an indicator. The measure of iodine absorbed by the oil or fat in the reaction gives the degree of unsaturation. Iodine value or number is a useful parameter in studying oxidative rancidity of oil since higher the unsaturation, the greater is the possibility of the oil to become oxidised by the atmospheric oxygen.

Materials & Reagent

- Iodine flask.
- Hanu's iodine solution: 6.8g of iodine dissolved in 412 ml of glacial acetic acid. Well powdered iodine is taken in a round bottom flask. 412 ml of glacial acetic acid is added in small quantities and the flask is heated on a boiling water bath. The clear solution is decanted from time to time followed by further addition of acid until all the iodine dissolves. The solution should be prepared in amber coloured bottle.
- Bromine solution: A 1.5% solution is prepared by dissolving 1.5 ml of bromine in 100 ml of glacial acetic acid and preserved in amber coloured bottle.
- 15% KI solution: the solution is prepared in water and preserved in amber coloured bottle.
- Standard 0.1N sodium thiosulphate solution: an approximately 0.1N solution of $\text{Na}_2\text{S}_2\text{O}_3$ is prepared by dissolving 6.2g of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in 250ml of water. The solution is standardized against standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
- 1% starch indicator: 1g starch is made into paste with about 10ml of distilled water and the suspension is pured into 90ml of boiling water and boil for 1-2min and colled.

- Chloroform.

Method:

- Accurately weigh 0.2 to 0.3g of fat or oil into a 500 ml iodine flask.
- Add 20ml of chloroform into the flask to dissolve oil completely.
- Pipette out 25ml of Hanu's iodine solution and 5ml of bromine solution into the flask and mix well. (N.B. use burette for adding Hanu's iodine solution)
- Close the flask with stopper and keep in dark for 30 mins.
- Add 20 ml of 15% KI solution and mix well.
- Titrate the content of the flask by standard sodium thiosulphate solution using starch as an indicator with vigorous shaking to extract the iodine from the chloroform layer.
- Continue the titration till discharge of blue colour (end point)
- Conduct a blank using 20ml chloroform instead of fat or oil.
- The bottles must be shaken thoroughly throughout the titration to ensure that all the iodine is expelled from the chloroform layer.

Calculation:

1ml of 1.0N $\text{Na}_2\text{S}_2\text{O}_3 = 0.12691\text{g}$ of Iodine

$$\text{Iodine value of fat or oil} = \frac{(V_1 - V_2)\text{ml} \times N \times 0.12691 \times 100}{W} \text{ gI}_2 / 100 \text{ g oil or fat}$$

Where,

W= Weight of the oil or fat

V_1 = Titre value of the sample

V_2 = Titre value of blank

N = Normality of $\text{Na}_2\text{S}_2\text{O}_3$