ALCOHOL BY EBULLIOMETER

ALCOHOL BURNING

Background

An ebulliometer is an instrument used for determination of the alcohol content of water-alcohol solutions by determining the difference in boiling points between pure water and the solution. Based on the comparison, the percentage alcohol (v/v) can be determined by referring to tables or using the calculating dial.

Equipment

- Dujardin-Salleron Ebulliometer (see detailed picture)
- Volumetric Pipets and Flasks (for dilution)

Reagents

- Reagent Alcohol
- DI Water

Procedure

Determine the boiling point of water:

1. Fill the lamp with 95% Reagent Alcohol.
2. Rinse the boiler and pour through the opening "A", 20 mL pure water measured with the sample vial filled to the mark "Eau."
3. Place the thermometer in position by inserting into opening "A".
4. Light the alcohol burner and place it under "B".
5. Soon after applying heat, the thermometer will register movement and steam will come out of the top vent. When the thermometer reading becomes stable, read the temperature.

a. Ex. The reading is 100 degrees and one tenth = 100.1 degrees.

b. Take the plastic calculating dial and move the circular sliding part until the division 100.1 degrees is directly opposite the zero of the fixed graduation.

6. This is the temperature reading for water to be used for this set of calculations.
7. Carefully move the ebulliometer body away from the burner.
8. Remove the thermometer and set aside on a soft surface.
9. Use the stopcock to drain the water and rinse carefully.

Using the Ebulliometer:

1. Open the stopcock, "F", empty the boiler, rinse it with some wine to be tested, pour out again and blow through upper tube, "C", to clear away the condensed steam.
2. Pour into the boiler 50 mL of sample, using the sample measure, and filling up to the mark "Vin."
3. Place the thermometer in "A", fill the condenser "D-E" with cold water, and heat as previously discussed.
4. The mercury will rise and stabilize; wait until the mercury is motionless to take the reading.
5. For example- the thermometer reads 90.7, compare this figure on the scale, which would read 13.5 degrees. This means that the tested wine has 13.5% of alcohol by volume.

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Determining Alcohol Concentration:

1. Determine the boiling point of water (see directions above).
2. Determine the boiling point for the sample (wine or diluted wine).
3. On the calculating dial, setting the zero on boiling point of water, find the corresponding % alcohol for the boiling point of the sample.

For diluted wine, remember to multiply this value by the dilution factor to determine the % alcohol content of the undiluted wine sample.

Notes

Read directions supplied with the ebulliometer. Replication of sample tests and using an ethanol-water standard as an outside check will reinforce and enhance the performance of the unit.

The boiling point of water must be checked and double-checked a minimum of once a day, and more frequently during periods of unstable weather. (Every 2 hours is recommended, since an undetected barometric movement of 4 mm Hg can contribute to an error of 0.5%).

The condenser water should be cold and changed for each sample run.

Dilute wine sample so the boiling point of the diluted wine is within 4 degrees Celsius of the boiling point of water, and the sugar content is less than 2%. Use volumetric pipets and flasks for all dilutions. The dilution water must be at the same temperature as the wine for optimal accuracy.

Suspended solids will significantly alter the boiling point of samples being tested, leading to errors in determination.

The ebulliometer must be kept clean. Boil out with 1N Sodium Hydroxide after about 50 uses. Boil with distilled water and rinse thoroughly before use after cleaning.

Keep alcohol lamp filled with denatured alcohol and make sure wick is not too short. Using a different alcohol (like 70% Isopropyl) will have a negative impact on both equipment maintenance and temperature stability during testing.

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