RUDOLPH RESEARCH ANALYTICAL

White Papers

Measuring Alcohol Density with a Density Meter requires specific sample preparation procedures for accurate results.

Procedures for sample preparation for measuring alcohol density with a Rudolph Research DDM2911 Density Meter

Application Report

Alcoholic Beverage Sample preparation:

In general, there are two basic types of alcoholic beverage classifications, each with a different procedure required prior to making any density measurements.

1) Alcoholic Beverages without Extract

This would include vodka, gin, fruit brandies, and any product produced by distillation and diluted with water, prior to other additives or storage in wooden barrels. Traces of small amounts of aromatic compounds, other alcohols and/or other volatiles are permitted. These types of beverages are considered pure alcohol/water mixtures and may be measured directly by the density meter without any sample preparation.

2) Alcoholic Beverages with Extract

In addition to the alcohol/water mixture, these beverages contain various amounts of colors, sugars, flavors, and fragrances. These all influence the density of the liquid and therefore will yield incorrect alcohol results. Therefore, it is necessary to separate these components from the alcohol fraction by distillation. By heating the alcoholic beverage during distillation, the alcohol evaporates which is then condensed and collected in a separate flask. The extract fraction remains behind in the original flask as it is not volatile.

This distillation analysis is a standard laboratory procedure. It requires a precise measurement made of the starting volume or weight of the original sample. After the distillation procedure, pure water is added to the alcohol fraction until it is back to the original starting volume or weight. This sample is now the exact same alcohol concentration as the original sample prior to the distillation. This sample may then be introduced into the density meter directly and its concentration determined.

From the extract fraction which remains behind in the original flask, the concentration of extract or "dry substance" may also be determined. This original flask is now also filled back to its starting volume or weight. Now this sample may be introduced into the density meter to determine its concentration. Most often, this extract concentration is treated as if it were pure sucrose. Therefore, the DDM 2911 Plus can automatically do the conversion from the extract's density to its concentration as % sucrose in solution or as ºBrix.

Filling the DDM 2911 Plus Density Meter:

Sample may be injected into the Density Meter manually by the use of a Luer tip syringe. Automation is also possible with the use of Rudolph Research Analytical's Auto-sampler.

Preservation of the Alcohol Sample's Integrity:

Sample containers with alcohol must always be covered tightly. As alcohol is hygroscopic, it has the tendency to absorb moisture from the surrounding environment. And as alcohol is also very volatile, it will evaporate into the atmosphere from an open container or evaporate into the head space above the liquid level in a closed container! Therefore, it is best to fill the container to nearly the very top. But if this is not possible or practical, the best procedure is to gently rock the container back and forth (not shaking!) to allow the liquid to re-absorb the evaporated alcohol in the head space prior to measuring in the density meter.