



Application Note AN-T-225

Analysis of caffeine, pH, and acidity in coffee

Fully automated determination including filtering, reagent addition, and sample pipetting using OMNIS

With the ever-increasing consumption of coffee due to the availability of small home espresso machines, shelf life and consistency of flavor are becoming more important for brand quality in a competitive market. Many of the key factors that influence coffee taste correlate with chemical properties that can be measured. These include pH, titratable acidity, refractive index, and caffeine. Historically, many of

these analyses have included long, manual sample preparation processes using the time-consuming, liquid chromatography (LC) technique. This Application Note looks at a faster, simpler, alternative method for analysis of key quality parameters in coffee using a single titration platform: OMNIS.

PH AND TITRATABLE ACIDITY

Coffee is primarily acidic, with most roast extracts displaying a pH of approximately five. When coffee is too acidic, it can taste sour and be harsh on the palette. When shifting to the alkaline end of the pH scale, the flavor then becomes bland and lifeless.

Different coffee beans require different amounts of roasting, depending on the bean origin and the level of acidity, to achieve the consistent flavor expected from the brand line. By analyzing the pH and acidity of

coffee brewed under consistent conditions, it is possible to judge the final flavor of a roast. This is most beneficial to roasters of large volumes of coffee beans, or to those who supply products with expected flavor profiles (e.g. instant coffee pods).

The analysis of pH and acidity in brewed coffee is quite simple and very similar to the procedure used for juices and soft drinks.

Table 1. Results of quality parameters in various coffee brews measured with OMNIS.

| Analyte | Sample 1 | Sample 2 |
|----------------------|----------|----------|
| pH | 5.37 | 6.41 |
| Acidity (mg/15 g) * | 9.9 | 7.1 |
| Caffeine (mg/15 g) * | 120 | 87 |

CAFFEINE

Unlike the simple sample preparation required for titratable acidity analysis, the analysis of caffeine in brewed coffee is a more intensive process that relies upon several manual preparation steps. Requiring reagent addition (iodine and sulfuric acid), filtration, and accurate sample volume transfer in specifically

timed steps to provide consistent results, the conventional analysis is very time consuming when performed manually.

The flexibility of OMNIS allows for the automation of these steps, eliminating the variability introduced by manual liquid handling and manual timing.



Figure 1. OMNIS Robot S with Discover and parallel analysis.

OMNIS automates the entire analysis process with:

- Discover Capping system which keeps samples covered until the time of analysis
- Highly accurate dosing of iodine and acid
- Consistent stirring time for reaction
- Automatic inline filtration
- Highly accurate dosing of sample to titration vessel
- Automatic start of titration
- Automatic cleaning of titration vessel and sample path

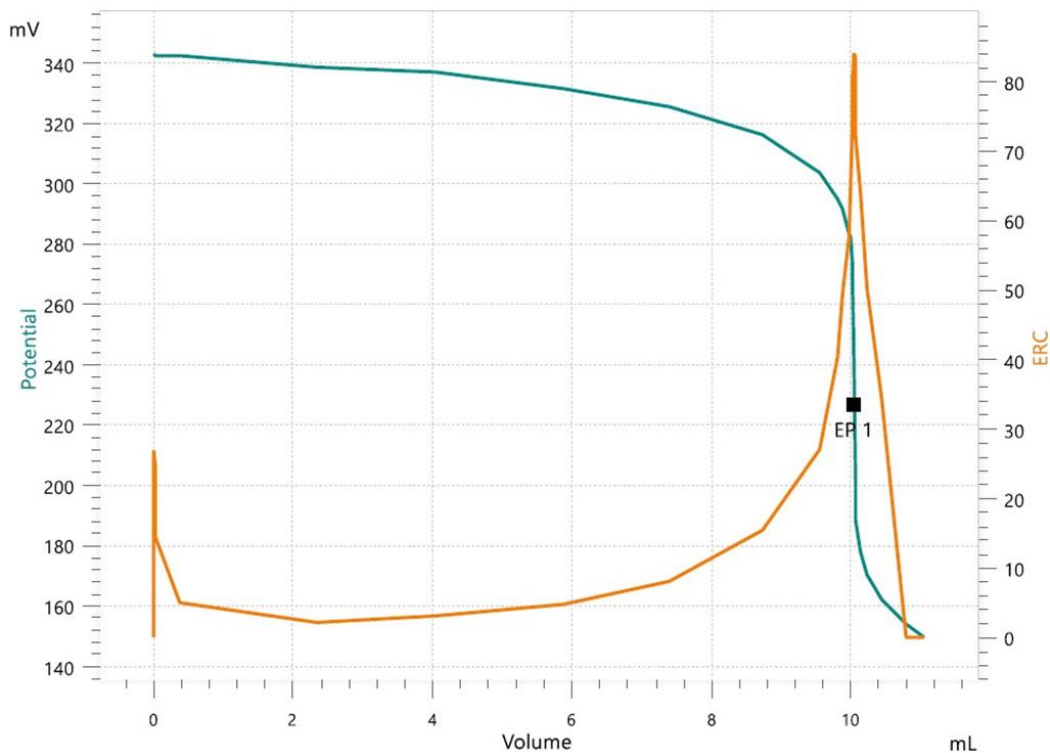


Figure 2. Figure 2. Example titration curve for caffeine analysis with OMNIS.

CONCLUSION

Metrohm’s OMNIS titration platform provides the perfect blend of automation and intelligence for the analysis of coffee. Instead of time-consuming manual sample preparation and long analysis times with several different instruments, key coffee quality

parameters can be measured accurately and reliably on a single system.

With OMNIS, you can enjoy your coffee without worrying about your analysis.

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