

Application Note AN-T-238

Determination of the alkalinity (p-value and m-value) in water

Fast and accurate potentiometric titration of alkalinity according to ASTM D1067 and EN ISO 9963-1

Alkalinity (sometimes referred to as water alkalinity) is a measure of the acid-binding capacity of water. Its degree depends on the amount of basic ions contained, mainly the carbonate content. Therefore, a distinction is made between total alkalinity (m-value) and carbonate alkalinity (p-value).

The analytical determination is carried out by titration with hydrochloric acid to pH 4.5 (turnover of the indicator methyl orange, hence «m-value»). If the initial pH of a sample is above 8.3, the acid consumption up to pH 8.3 (within the envelope of the indicator phenolphthalein, therefore «p-value») can be titrated as an intermediate step.

In this Application Note, the determination of pH and alkalinity in water with a titration method is presented. This method conforms to EPA 310.1, Standard Methods 2320 B (Titration Method), ASTM D1067, and both EN ISO 9963-1 and 9963-2.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on tap water. Sample preparation is not required.

EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with a dUnitrode with integrated Pt1000 (Figure 1).
An appropriate amount of water is pipetted into the titration beaker. After pH measurement, the p- and m-values are determined with fixed endpoints (FP) at pH 8.2 and 4.5 using standardized hydrochloric acid.



Figure 1. OMNIS Professional Titrator equipped with a dUnitrode with integrated Pt1000.

RESULTS

This method offers very accurate results, as displayed in Table 1. One exemplary curve for alkalinity titration for water is shown in Figure 2.

Table 1. Results of the p alkalinity and m alkalinity of tap water expressed in mmol/L (n = 5).

Sample (n = 5)	p-value in mmol/L	m-value in mmol/L
Mean value	0.039	2.261
SD(abs)	0.002	0.001
SD(rel) in %	5.7	0.1

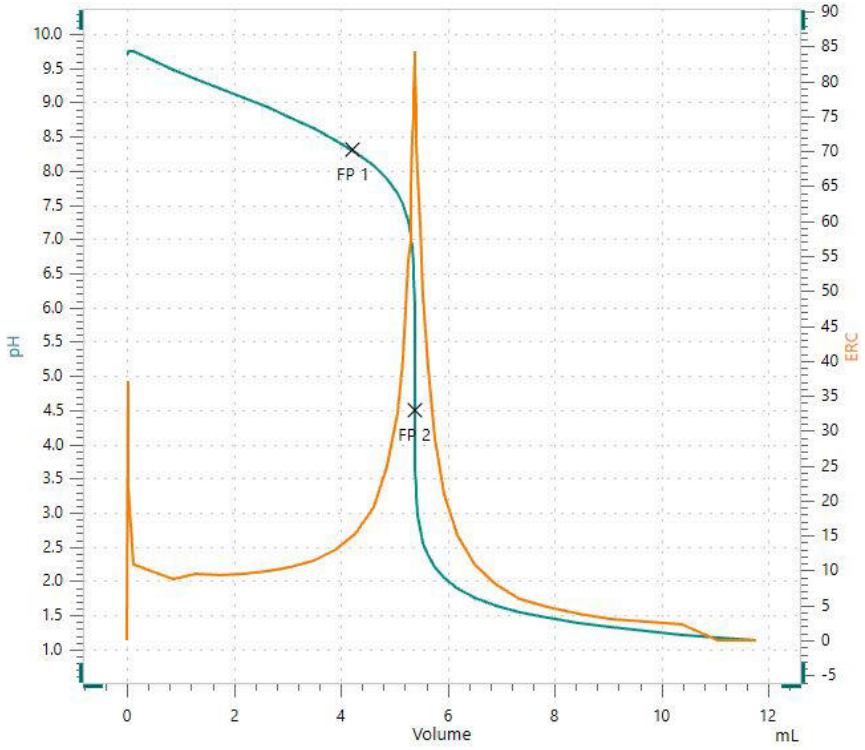


Figure 2. Titration curve showing a potentiometric determination of p alkalinity and m alkalinity with fixed endpoints at pH = 8.3 (FP1) and pH = 4.5 (FP2).

CONCLUSION

The presented titration method for alkalinity is used to accurately measure the p-value and m-value in tap water. This method conforms to EPA 310.1, Standard Methods 2320 B (Titration Method), ASTM D1067, and both EN ISO 9963-1 and 9963-2.

Precise and reliable determinations of alkalinity in water by titration with HCl are made easy using the OMNIS Professional Titrator equipped with a dUnitrode with integrated Pt1000. This system offers users flexibility combined with high-end software. The dUnitrode is suitable for pH measurements as well as titrations in water samples. The fixed ground-joint diaphragm is resistant to contamination and the electrode works even at elevated temperatures.

Aside from improving the precision and speed of the determinations, OMNIS delivers results on par with or better than other established titration systems.

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CONFIGURATION



OMNIS Professional Titrator with magnetic stirrer

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system for endpoint titration and equivalence point titration (monotonic/dynamic). Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a rod stirrer added as needed. Including "Professional" function license for parallel titration with additional titration or dosing modules.

- Actuation via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Safe handling of chemicals, automatic transfer of the original reagent data from the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with 5-way parallel titration: "Professional" function license