Application Note AN-T-227

Determination of sodium lactate

Comparison of USP–NF 2021, Issue 2 and a modified method for absolute sodium lactate content via titration

Sodium lactate is a salt form of lactic acid used in foodstuffs, cosmetics, paper, clothes, biopolymers, and in medicine. As it is used in many regulated industries, an accurate determination of the lactate content is required and is already covered in several norms. One exemplary monograph by the US Pharmacopoeia (USP) results in high accuracies and well-defined titration curves but uses titrants and solvents that are more costly than necessary. This USP method requires a blank determination, glacial acetic acid and acetic anhydride as solvents, and a solution of perchloric acid in acetic acid as titrant.

In comparison, the presented modified method from Metrohm requires a 1:1 mixture of water and acetone and uses aqueous hydrochloric acid as titrant, resulting in an estimated cost reduction of 40% per titration compared to the USP method (USP–NF 2021, Issue 2). Furthermore, the time needed for each analysis is reduced to just 12% of the USP method (excluding blank determination).

This Application Note presents both methods to determine lactate content and shows the results obtained on an OMNIS system.

SAMPLE AND SAMPLE PREPARATION

Solid sodium lactate (300 mg) is dissolved in 100 mL of deionized water.

USP: Sample equivalent to 300 mg lactate is weighed accurately and dissolved in a 5:1 mixture of acetic anhydride and glacial acetic acid. The sample is allowed to stand for 20 minutes. Blank samples are also prepared.

Metrohm: Dilute a sample equivalent to 300 mg in a 1:1 mixture of acetone and water.

EXPERIMENTAL

USP: Titrate the blank and sample with 0.1 N perchloric acid until after the first equivalence point.

Metrohm: Titrate the sample directly with 0.1 mol/L HCl solution until after the first equivalence point (EP).

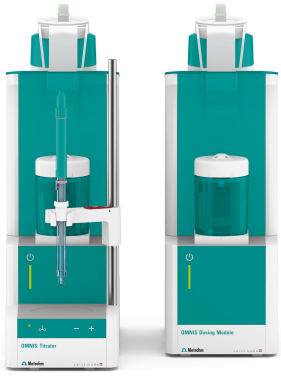

Figure 1. OMNIS Titrator with the digital pH electrode and an OMNIS Dosing Module.

Table 1. Summarized results for the sodium lactate determination (n = 3).

Method	Recovery	RSD (%)
USP	97.77	0.53
Metrohm	96.56	0.93

RESULTS

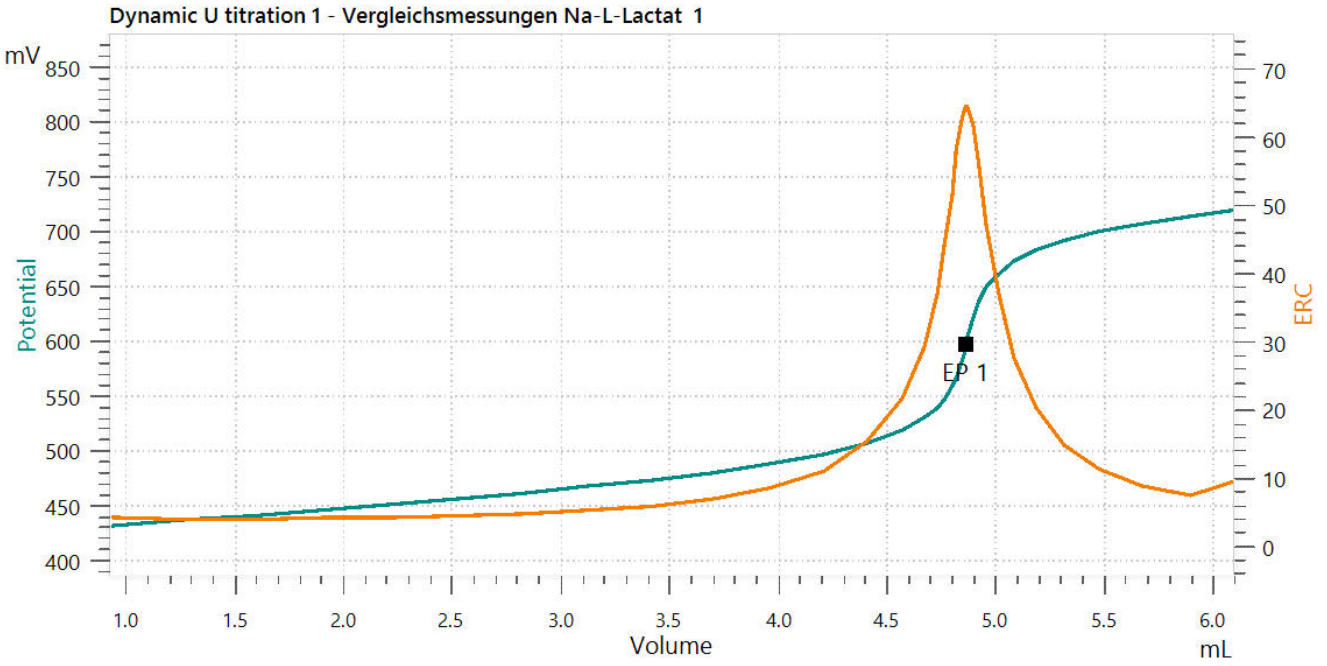

Figure 2. Exemplary titration curve according to USP of an aliquot of sodium lactate against perchloric acid as titrant.

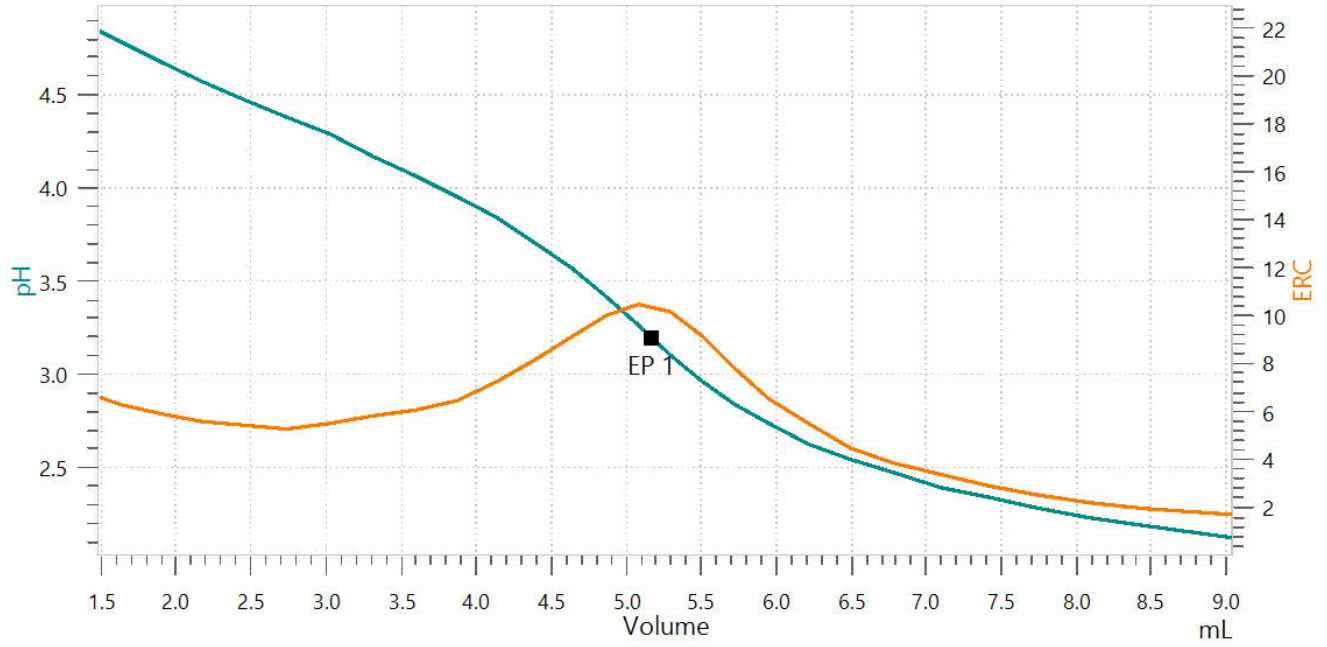

Figure 3. Exemplary titration curve of an aliquot of sodium lactate against HCl as titrant.

Both methods for the determination of lactate show comparable results. The USP method is slower and more expensive but the obtained EP has a higher potential jump and ERC. However, the method gives a second EP after this region that is unrelated to sodium lactate. The Metrohm modified method is faster and cost-efficient but shows slightly lower recoveries and the EP is less pronounced. In contrast to the USP method, the Metrohm method does not show a second EP and is therefore less ambiguous as well.

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