

Optical Rotation Measurement for High-concentration Acidic Sample Solutions

Introduction

In certain optical rotation tests described in the United States pharmacopeia (USP) and the Japanese pharmacopoeia (JP), sample preparation requires the use of acidic solutions such as 5 N hydrochloric acid (USP) or 6 mol/L hydrochloric acid (JP). Because optical rotation is temperature-dependent, it is important to monitor the temperature during measurements. The P-4000 series polarimeters are equipped with a temperature sensor that can be inserted directly into the cell. This cell sensor has an acid-resistant coating, allowing direct measurement of the temperature of acidic sample solutions.

To protect the instrument when measuring acidic liquid samples, the P-4000 series incorporates the following features:

- Acid-resistant coating on the sample compartment wall
- Quartz window preventing acidic gas from entering the instrument*
- Ventilation of acidic gas*
- Connection to a ventilation duct**

* Standard feature only for the P-4200 and P-4300

** Optional for the P-4200 and P-4300

This application note describes the measurement of L-alanine in 6 mol/L hydrochloric acid.

Keywords

Polarimeter, acid resistant, 6 mol/L hydrochloric acid, L-alanine

Experimental

Sample

L-alanine (research reagent)

In accordance with the monograph described in JP XVIII1) (after drying, 2.5 g, 6 mol/L hydrochloric acid TS, 25 mL, 100 mm), the sample was prepared by dissolving dried L-alanine in a 6 mol/L hydrochloric acid solution.

System

Instrument: P-4200 polarimeter

Cell: RQC-450 8.5-mm rectangular quartz cell (path length: 100 mm)

Measurement conditions

Light source: Na lamp Wavelength: D-line

Integration time: 5 sec Number of repeats: 1



Fig.1 P-4200 Polarimeter

Results and Discussion

Table 1 shows the measurement results for the specific rotation of L-alanine. The acid-resistant cell sensor enables accurate monitoring of the sample temperature, even for a strong acid solution of 6 mol/L hydrochloric acid, allowing precise measurement of the optical rotation.

Table 1 Results for L-alanine

Specific rotation	Temperature during measurement / °C
+14.824	20.4

Conclusion

The P-4000 series polarimeters allow accurate measurement of optical rotation for highly acidic sample solutions, such as 6 mol/L hydrochloric acid, while directly monitoring the sample temperature. Additionally, these polarimeters exhibit high resistance to acidic samples, enabling reliable operation while maintaining the instrument in optimal condition.

References

1. Ministry of Health, Labour and Welfare: June 7, 2021, MHLW Ministerial Notification No. 220, "The Japanese Pharmacopoeia 18th edition", (2021).