

Pharmaceutical

Moisture of Lactose

Volumetric titration (Direct Method) by
Karl Fischer Moisture Titrator

Standard	JIS	K 0113	Japanese pharmacopoeia
	ASTM	E 203	
	ISO	760	

1. Abstract

Moisture titration using Karl Fischer reagent is popularly practiced water determination worldwide as the most reliable method. The procedure is adopted in many official standards as test method specified in ISO, ASTM, DIN, BS and JIS.

The test conducted this time is an example of volumetric moisture titration according to JIS K 0113-2005 for measurement of water content in Lactose, which dissolves with ease in FM extracting medium.

2. Reference

- 1) JIS K 0113-2005: Standard Test Method by Potentiometric, Amperometric, Coulometric and Karl Fischer Titration
- 2) ASTM E 203-16 Standard Test Method for Water Using Volumetric Karl Fischer Titration
- 3) ISO 760:1978 Determination of Water-Karl Fischer method (General method)
- 4) Hydranal manual published by Riedel de Haen
- 5) Japanese Pharmacopoeia Codex 17

3. Cautions in measurement

- 1) In order to refrain from the effect of ambient humidity, the test must be conducted in a well air-conditioned room.
- 2) Handle with care when you work on chemical.
- 3) Obtain the factor of Karl Fischer reagent using the solvent in advance.
- 4) Generally FM solvent is used for Saccharide, except for Lactose use FM II.

4. Post-measurement care

After the reagent is drained out and the electrode is cleaned, keep the titration flask filled with extracting solvent.

5. Test equipment

Main unit : Karl Fischer moisture titration volumetric system
Electrode : Twin platinum electrode for KF titration

6. Reagent

Titrant : Hydranal Composit 2 and 5 (Riedel de Haen)
Solvent : Extracting medium FMII (for saccharide) (Hayashi Chemicals)

7. Measurement procedure

-Pretreatment-

- 1) Prepare approximately 30mL extracting medium FMII in titration cell.
- 2) Dehydrate the measuring cell by performing pre-titration in advance.

-Measurement-

- 1) Prepare approximately 0.2g sample in a sampler.
- 2) Weigh the sampler on an electronic balance of which precision is to the nearest 0.1mg.
- 3) Transfer the sample in sampler to titration cell to dissolve in solvent.
- 4) Press Start key of titration unit.
- 5) Weigh the sampler of the above 3).
- 6) Enter the weight of item 2) for Wt1, and 5) for Wt2.
- 7) Obtain water content from titration volume, of which EP is detected automatically.

8. Formula

$$\text{Moisture (\%)} = ((\text{Data} \times \text{F} - \text{Blank}) / (\text{Wt1} - \text{Wt2})) \times 0.1$$

Data : Titration volume (mL)
F : Factor of titrant(mg H₂O / mL)
Blank : Blank level (mg)
Wt1 : Sample + Sampler (g)
Wt2 : Empty sampler (g)

9. Example of measurement

-Titration parameter-

MKV-710M/S,MKA-610	MKA-520	MKS-500
Method No. 1 [Titration] Titr.mode Normal t(stir) 0 s t(wait) 10 s t(max) 0 s t(interval) 0 s Max.volume 10 mL Titr.bur.No. 1 Dose mode Off [Control] End time 30 s Final vol. 0.01 mL Titr.speed 3 Detect.mode 1 Drift titr. On Start mode Manual End level 75 mV Samp.time 5 s Stir.speed 4	[Titration] Method 1 Titr Mode Normal Titr Buret No. 1 End Time 30 s Final Vol. 0.01 mL Titr.Speed 3 Detector Mode 1 t(stir) 0 s t(wait) 10 s t(max) 0 s Drift Titr On Start Manual Max.Volume 10 mL Dose mode Off Oven Off	[Titration] Method Driect Titr.Speed 3 End Time 30 s Final Vol. 0.01 mL Detector Mode Normal t(stir) 0 s t(max) 0 s Drift Titr. On Max.Volume 10 mL

-Calculation parameter-

MKV-710M/S,MKA-610	MKA-520	MKS-500
[Calculation] Calc.type Sample Blank No. 1 Calc.No. 2 Unit % Decimal 2 Fraction Round (Half adjust) Drift comp. Off Evaluation Off	[Calculation] Calc. 2 Unit % Weight Variable	[Calculation] g->%

–Measurement result–

Sample name	Sample (g)	Extracting medium	Water content	
			mg	%
Lactose (Anhydride)	0.1539	Solvent FMII	0.90	0.58
Lactose (Monohydrate)	0.1840	Solvent FMII	9.24	5.02

10.Summary

Lactose is disaccharide of chemical formula $C_{12}H_{22}O_{11}$ with molecular mass 342.3, contained in mammals whether cow milk or human.

The test sample in this application dissolves in solvent FMII, which makes moisture titration performed with ease.

Stable measurement of water content is assured by Karl Fischer moisture titration.