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Aluminum Dichlorohydrate

$Al_y(OH)_{3y-z}Cl_z \cdot nH_2O$
Aluminum chlorohydroxide;
Aluminum hydroxychloride.

DEFINITION

Aluminum Dichlorohydrate consists of complex basic aluminum chloride that is polymeric and loosely hydrated and encompasses a range of aluminum-to-chloride atomic ratios between 0.90:1 and 1.25:1. It contains the equivalent of NLT 90.0% and NMT 110.0% of the labeled amount of anhydrous aluminum dichlorohydrate [$Al_y(OH)_{3y-z}Cl_z$].

IDENTIFICATION

• **A. Identification Tests—General, *Aluminum*⟨191⟩and*Chloride*⟨191⟩**

Sample solution: 100 mg/mL

Acceptance criteria: Meets the requirements

ASSAY

• **Procedure 1: Content of Chloride**

Sample: 700 mg

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N silver nitrate VS

Electrode system: A glass silver–silver chloride electrode and a silver billet electrode system

Endpoint detection: Potentiometric

Analysis: Transfer the *Sample* to a 250-mL beaker, and add 100 mL of water and 10 mL of diluted nitric acid with stirring. Titrate with *Titrant*, and determine the endpoint potentiometrically. Each mL of 0.1 N silver nitrate is equivalent to 3.545 mg of chloride (Cl). Use the chloride content thus obtained to calculate the aluminum:chloride atomic ratio.

• **Procedure 2: Content of Aluminum**

Edetate disodium titrant: Prepare and standardize as directed in *Reagents*, *Volumetric Solutions*, *Edetate Disodium, Twentieth-Molar (0.05 M)*, except use 37.2 g of edetate disodium.

Sample solution: Transfer 200 mg of Aluminum Dichlorohydrate to a 250-mL beaker, add 20 mL of water and 5 mL of hydrochloric acid, boil on a hot plate for NLT 5 min, and allow to cool.

Titrimetric system

Mode: Back-titration

Titrant: 0.1 M zinc sulfate VS

Endpoint detection: Visual

Analysis: To the *Sample solution* add 25.0 mL of *Edetate disodium titrant*, and adjust with 2.5 N ammonium hydroxide or 1 N acetic acid to a pH of 4.7 ± 0.1. Add 20 mL of acetic acid–ammonium acetate buffer TS, 50 mL of alcohol, and 5 mL of dithizone TS. The pH of this solution should be 4.7 ± 0.1. Titrate the excess edetate disodium with *Titrant* until the color changes from green-violet to rose-pink. Perform a blank titration, and make any necessary correction. Each mL of 0.1 M *Edetate disodium titrant* consumed is equivalent to 2.698 mg of aluminum (Al). Use the aluminum content thus obtained to calculate the aluminum:chloride atomic ratio.

• **Procedure 3: Aluminum:Chloride Atomic Ratio**

Analysis: Use the percentage of aluminum found in the test for *Content of Aluminum* and the percentage of chloride found in the test for *Content of Chloride*.

Calculate the aluminum:chloride atomic ratio (X) as follows:

$$\text{Result} = (p_{Al}/p_{Cl}) \times (A_{Cl}/A_{Al})$$

p_{Al} = percentage of aluminum found in *Content of Aluminum*

p_{Cl} = percentage of chloride found in *Content of Chloride*

A_{Cl} = atomic weight of chlorine (Cl), 35.453

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A_{Al} = atomic weight of aluminum (Al), 26.98

Acceptance criteria: Between 0.90:1 and 1.25:1

• **Procedure 4**

Analysis: Calculate the percentage of anhydrous aluminum dichlorohydrate $[Al_y(OH)_{3y-z}Cl_z]$ in the portion of Aluminum Dichlorohydrate taken:

$$\text{Result} = P_{Al}(\{A_{Al}X + [M(3X - 1)] + A_{Cl}\}/A_{Al}X)$$

P_{Al} = percentage of aluminum as obtained in the test for *Content of Aluminum*

A_{Al} = atomic weight of aluminum (Al), 26.98

X = aluminum:chloride atomic ratio, as determined in the test for *Aluminum:Chloride Atomic Ratio*

M = molecular weight of the hydroxide anion (OH), 17.01

A_{Cl} = atomic weight of chlorine (Cl), 35.453

Acceptance criteria: 90.0%–110.0% on the anhydrous basis

IMPURITIES

Change to read:

• ▲*Arsenic ⟨211⟩, Procedures, Procedure 1*▲ (CN 1-Jun-2023) **:** NMT 2 ppm

Change to read:

• **Limit of Iron**

Standard solution: Transfer 2.0 mL of *Standard Iron Solution*, prepared as directed in ▲*Iron ⟨241⟩, Procedures, Procedure 1*▲ (CN 1-Jun-2023) , to a 50-mL beaker.

Sample solution: Transfer 2.7 g of Aluminum Dichlorohydrate to a 100-mL volumetric flask, dilute with water to volume, and mix. Transfer 5.0 mL of this solution to a 50-mL beaker.

Analysis: To each of the beakers containing the *Standard solution* and the *Sample solution*, add 5 mL of 6 N nitric acid, cover with a watch glass, and boil on a hot plate for 3–5 min. Allow to cool. Add 5 mL of *Ammonium Thiocyanate Solution* (prepared as directed in ▲*Iron ⟨241⟩, Procedures, Procedure 1*▲ (CN 1-Jun-2023)), transfer to separate 50-mL color comparison tubes, and dilute with water to volume.

Acceptance criteria: 150 ppm; the color of the solution from the *Sample solution* is not darker than that of the solution from the *Standard solution*.

SPECIFIC TESTS

• **pH ⟨791⟩**

Sample solution: 15 g of Aluminum Dichlorohydrate in 100 g of water

Acceptance criteria: 3.0–5.0

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in well-closed containers.

• **Labeling:** The label states the content of anhydrous aluminum dichlorohydrate.

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Topic/Question	Contact	Expert Committee
ALUMINUM DICHLOROHYDRATE	Documentary Standards Support	SM32020 Small Molecules 3
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM32020 Small Molecules 3

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