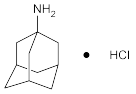
atomic weight of zirconium corrected for 2% hafnium content, 17.01 is the molecular weight of the hydroxide anion (OH), and 35.453 is the atomic weight of chlorine (Cl).

Amantadine Hydrochloride



$C_{10}H_{17}N \cdot HCl$ 187.71

Tricyclo[3.3.1.1^{3,7}]decan-1-amine, hydrochloride; 1-Adamantanamine hydrochloride [665-66-7].

DEFINITION

Amantadine Hydrochloride contains NLT 98.5% and NMT 101.5% of $C_{10}H_{17}N \cdot HCl$.

IDENTIFICATION

- **A. Infrared Absorption** ⟨197S⟩
  Cell: 1 mm
  Sample solution: 50 mg in 10 mL of 0.1 N hydrochloric acid, and filter. Transfer the filtrate to a suitable separator, add 1 mL of 5 N sodium hydroxide, and extract with 5 mL of methylene chloride.
  Acceptance criteria: Meets the requirements

ASSAY

- **Procedure**
  Sample: Dissolve 120 mg of Amantadine Hydrochloride in a mixture of 30 mL of glacial acetic acid and 10 mL of mercuric acetate TS.
  Analysis: Titrate with 0.1 N perchloric acid VS, determining the endpoint potentiometrically, using suitable electrodes. Perform a blank determination. Each mL of 0.1 N perchloric acid is equivalent to 18.77 mg of amantadine hydrochloride ($C_{10}H_{17}N \cdot HCl$).
  Acceptance criteria: 98.5%–101.5%

IMPURITIES

- **Heavy Metals,** *Method I* ⟨231⟩
  Test preparation: Use 1 mL of 1 N acetic acid.
  Acceptance criteria: NMT 10 ppm
- **Organic Impurities**
  Internal standard solution: 50 mg/mL of adamantane in dichloromethane
  Standard solution: Transfer 10 mg of USP Amantadine Hydrochloride RS to a separator. Add 20 mL of 5.0 N sodium hydroxide and 18 mL of dichloromethane, and shake for 10 min. Remove the water layer, dry the organic layer by swirling with anhydrous sodium sulfate, and allow to stand for a few min to ensure that all remaining water has been removed. Filter, collect the filtrate in a 20-mL volumetric flask, add 0.2 mL of *Internal standard solution*, and dilute with dichloromethane to volume.
  Sample solution: Transfer 1.0 g of Amantadine Hydrochloride to a separator. Add 20 mL of 5.0 N sodium hydroxide and 18 mL of dichloromethane, and shake for 10 min. Remove the water layer, dry the organic layer by swirling with anhydrous sodium sulfate, and allow to stand for a few min to ensure that all remaining water has been removed. Filter, collect the filtrate in a 20-mL volumetric flask, add 0.2 mL of *Internal standard solution*, and dilute with dichloromethane to volume.
  Chromatographic system
  (See *Chromatography* ⟨621⟩, *System Suitability*.)
  Mode: GC
  Detector: Flame ionization
  Detector temperature: 300°
  Column: 0.53-mm × 30-m fused-silica column coated with 1.0-µm G27 stationary phase
  Column temperature: See *Table 1*.

Table 1

Initial Temperature (°)	Temperature Ramp (°/min)	Final Temperature (°)	Hold Time at Final Temperature (min)
70	0	70	5
70	10	250	At least 17

  Carrier gas: Helium
  Flow rate: 4 mL/min
  Injection size: 2 µL
  Injector temperature: 220°
  Injection type:
  Split flow: 200 mL/min
  Split flow ratio: 50:1
  System suitability
  Sample: *Standard solution*
  [NOTE—The relative retention times for adamantane and amantadine are about 0.7 and 1.0, respectively.]
  Suitability requirements
  Resolution: NLT 20 between adamantane and amantadine
  Relative standard deviation: NMT 5.0% determined from the peak response ratios of amantadine to adamantane
  Analysis
  Samples: *Standard solution* and *Sample solution*
  Calculate the percentage of each impurity in the portion of amantadine hydrochloride ($C_{10}H_{17}N \cdot HCl$) taken:

$$\text{Result} = (R_U/R_S) \times (C_S/C_U) \times 100$$

  R_U = peak response ratio of each impurity to adamantane from the *Sample solution*
  R_S = peak response ratio of amantadine to adamantane from the *Standard solution*
  C_S = concentration of USP Amantadine Hydrochloride RS in the *Standard solution* (mg/mL)
  C_U = concentration of the *Sample solution* (mg/mL)
  Acceptance criteria
  Individual impurities: NMT 0.3%
  Total impurities: NMT 1.0%

SPECIFIC TESTS

- **pH** ⟨791⟩
  Sample: 0.2 g/mL in water
  Acceptance criteria: 3.0–5.5
- **Clarity and Color of Solution**
  Sample: Dissolve 2 g in 10 mL of water.
  Acceptance criteria: Solution is clear and nearly colorless.

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in well-closed containers.
- **USP Reference Standards** ⟨11⟩
  USP Amantadine Hydrochloride RS

Amantadine Hydrochloride Capsules

DEFINITION

Amantadine Hydrochloride Capsules contain NLT 95.0% and NMT 105.0% of the labeled amount of amantadine hydrochloride ($C_{10}H_{17}N \cdot HCl$).

IDENTIFICATION

- **Infrared Absorption** ⟨197S⟩
  Cell: 1 mm
  Sample solution: Place the contents of Capsules, equivalent to 200 mg of amantadine hydrochloride, in a vessel, dissolve in 0.1 N hydrochloric acid, and filter. Transfer the filtrate to