Chromatographic system (see *Chromatography* ⟨621⟩)—The gas chromatograph is equipped with an on-column, temperature-programmable injector, a flame-ionization detector maintained at about 275°, and a 0.32-mm × 30-m column bonded with a 0.5-µm layer of phase G42. The column temperature is programmed as follows. Initially the temperature of the column is maintained at about 80° for 0.5 minute, then increased at a rate of 20° per minute to about 220°, and maintained at about 220° for 10 minutes. The injection port temperature is programmed as follows. Initially the temperature is maintained at about 85° for 0.5 minute, then increased at a rate of 20° per minute to about 225°, and maintained at about 225° for 10 minutes. The carrier gas is helium, flowing at a rate of about 2.3 mL per minute. Chromatograph the *System suitability solution,* and record the peak responses as directed for *Procedure:* the relative retention times are about 0.9 for triethyl citrate and 1.0 for acetyltriethyl citrate; the resolution, *R,* between triethyl citrate and acetyltriethyl citrate is not less than 1.5; and the relative standard deviation for replicate injections is not more than 2.0% determined from both the triethyl citrate and acetyltriethyl citrate peaks, based on area percent calculation.

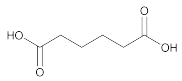
Procedure—Inject 1 µL of the *Assay preparation* into the chromatograph, record the chromatogram, and measure all of the peak areas, excluding the solvent peak. Calculate the percentage of $C_{14}H_{22}O_8$ in the portion of Acetyltriethyl Citrate taken by the formula:

$$100(A/B)$$

in which *A* is the acetyltriethyl citrate peak area response; and *B* is the sum of the area responses of all the peaks.

Activated Charcoal—*see Activated Charcoal General Monographs*

Adipic Acid



$C_6H_{10}O_4$ 146.1
Hexanedioic acid;
1,4-Butanedicarboxylic acid [124-04-9].

DEFINITION
Adipic Acid contains NLT 99.0% and NMT 101.0% of $C_6H_{10}O_4$, calculated on the dried basis.

IDENTIFICATION
• **A. Infrared Absorption** ⟨197K⟩

ASSAY
• **Procedure**
Sample: 60 mg
Titrimetric system
(See *Titrimetry* ⟨541⟩.)
Mode: Direct titration
Titrant: 0.1 N sodium hydroxide VS
Blank: 50.0 mL of water
Endpoint detection: Colorimetric
Analysis: Dissolve the *Sample* in 50 mL of water. Add 0.2 mL of phenolphthalein TS, and titrate with 0.1 N sodium hydroxide VS to a permanent pale pink endpoint. Perform a blank determination. Calculate the percentage of adipic acid ($C_6H_{10}O_4$) in the *Sample* taken:

$$\text{Result} = [(V - B) \times N \times F \times 100]/W$$

V = titrant volume consumed by the *Sample* (mL)
B = titrant volume consumed by the *Blank* (mL)
N = titrant actual normality (mEq/mL)
F = equivalency factor, 73.1 mg/mEq
W = weight of the *Sample* (mg)
Acceptance criteria: 99.0%–101.0% on the dried basis

IMPURITIES
• **Residue on Ignition** ⟨281⟩**:** NMT 0.1%
• **Limit of Nitrates**
Standard stock solution: 1.63 mg/mL of potassium nitrate
Standard solution: Dilute 1 mL of the *Standard stock solution* with water to 10 mL. Dilute 1 mL of this solution with water to 50 mL to obtain a solution containing 2 µg/mL of nitrate.
Sample solution: Transfer 5 g of Adipic Acid to a 50-mL volumetric flask. Dissolve in water, with heating, and dilute with water to volume. Allow to cool and crystallize, then pass through a sintered-glass filter. Wash the filter with water, and collect the filtrate and washings until a volume of 50 mL is obtained. [Note—This solution is also to be used for *Chloride*, *Sulfate*, *Iron*, and *Heavy Metals*.]
Control: 2 mg/L of potassium permanganate
Analysis: Transfer 1.0 mL of the *Sample solution*, 1.5 mL of the *Standard solution*, and 1 mL of water (blank) to three separate flasks. To each flask add 2 mL of concentrated ammonia, 0.5 mL of 10 mg/mL manganese sulfate, and 1 mL of 10 mg/mL sulfanilamide, and dilute each solution with water to 20 mL. Add 100 mg of zinc powder to each of the three flasks, and cool in an ice bath for 30 min, shaking the solutions periodically. Separately filter 10 mL of each solution, cool in an ice bath, and then add 2.5 mL of hydrochloric acid and 1 mL of 10 mg/mL of naphthylethylenediamine dihydrochloride. Allow the solutions to stand at room temperature for 15 min.
System suitability: The test is invalid if the concomitantly prepared blank solution is darker than the *Control*.
Acceptance criteria: The color of the solution containing the *Sample solution* is not darker than the concomitantly prepared solution containing the *Standard solution* (NMT 30 ppm).
• **Heavy Metals,** *Method I* ⟨231⟩**:** NMT 10 ppm
• **Chloride and Sulfate,** *Chloride* ⟨221⟩
Sample: A 5-mL portion of the *Sample solution* from *Limit of Nitrates*
Analysis: Proceed as directed in the chapter.
Acceptance criteria: The *Sample* shows no more chloride than a corresponding 0.14-mL portion of 0.020 N hydrochloric acid (NMT 0.02%).
• **Chloride and Sulfate,** *Sulfate* ⟨221⟩
Sample: A 5-mL portion of the *Sample solution* from *Limit of Nitrates*
Analysis: Proceed as directed in the chapter.
Acceptance criteria: The *Sample* shows no more sulfate than a corresponding 0.26-mL portion of 0.020 N sulfuric acid (NMT 0.05%).
• **Iron** ⟨241⟩
Sample: A 10-mL portion of the *Sample solution* from *Limit of Nitrates*
Analysis: Proceed as directed in the chapter.
Acceptance criteria: NMT 10 ppm

SPECIFIC TESTS
• **Melting Range or Temperature** ⟨741⟩**:** 151°–154°
• **Loss on Drying** ⟨731⟩**:** Dry a sample at 105° to constant weight; it loses NMT 0.2% of its weight.

ADDITIONAL REQUIREMENTS
• **Packaging and Storage:** Preserve in a tight containers. No storage requirements specified.

• **USP REFERENCE STANDARDS** ⟨**11**⟩
USP Adipic Acid RS

Agar

Add the following:

▲[9002-18-0].▲*NF30*

DEFINITION

Change to read:

Agar is the dried, hydrophilic, colloidal substance ▲consisting of the polysaccharides▲*NF30* extracted from *Gelidium cartilagineum* (Linné) Gaillon (Fam. Gelidiaceae), *Gracilaria confervoides* (Linné) Greville (Fam. Sphaerococcaceae), and related red algae (Class Rhodophyceae).

IDENTIFICATION

Add the following:

▲• **A. INFRARED ABSORPTION** ⟨**197K**⟩▲*NF30*

Change to read:

• ▲**B.**▲*NF30* Iodine TS colors some of the fragments of Agar bluish black, with some areas reddish to violet.

Change to read:

• ▲**C.**▲*NF30*
Analysis: Boil a sample with 65 times its weight of water for 10 min, with constant stirring, and ▲subsequently▲*NF30* adjust with hot water to a concentration of 1.5%, by weight.
Acceptance criteria: Agar forms a clear liquid that congeals at ▲30°▲*NF30*–39° to form a firm resilient gel, which does not ▲liquefy below 80°.▲*NF30*

IMPURITIES
Inorganic Impurities
• **ARSENIC,** *Method II* ⟨**211**⟩**:** NMT 3 ppm
• **LEAD** ⟨**251**⟩**:** NMT 10 ppm
• **HEAVY METALS,** *Method II* ⟨**231**⟩**:** NMT 40 ppm
• **ARTICLES OF BOTANICAL ORIGIN,** *Acid-Insoluble Ash* ⟨**561**⟩**:** NMT 0.5%, on a dry-weight basis

Change to read:

Organic Impurities
• **PROCEDURE 1: LIMIT OF GELATIN**
Sample solution: Dissolve 1 g of sample in 100 mL of boiling water. Allow to cool to about 50°.
Analysis: To 5 mL of the *Sample solution* add 2–3 drops of a mixture of 0.2 M potassium dichromate solution and 3 N hydrochloric acid (4:1).
Acceptance criteria: No yellow precipitate is formed.
• **PROCEDURE 2: LIMIT OF FOREIGN STARCH**
Sample solution: Boil 0.10 g in 100 mL of water.
Acceptance criteria: The *Sample solution* does not, upon cooling, produce a blue color upon the addition of iodine TS.
• **PROCEDURE 3: LIMIT OF FOREIGN INSOLUBLE MATTER**
Sample ▲dispersion:▲*NF30* Add sufficient water to 7.5 g of sample to make 500 g, boil for 15 min, and readjust to the original 500 g.
Analysis: To 100 g of the uniformly mixed *Sample* ▲*dispersion*▲*NF30* add hot water to make 200 mL. Heat almost to boiling, filter while hot through a tared filtering crucible. Rinse the container with several portions of hot water, and pass these rinsings through the crucible. Dry the crucible and its contents at 105° to a constant weight.
Acceptance criteria: NMT 15 mg (1.0%) remains in the crucible.
• **PROCEDURE 4: ARTICLES OF BOTANICAL ORIGIN,** *Foreign Organic Matter* ⟨**561**⟩**:** NMT 1.0%

SPECIFIC TESTS

Change to read:

• **MICROBIAL ENUMERATION TESTS** ⟨**61**⟩ and **TESTS FOR SPECIFIED MICROORGANISMS** ⟨**62**⟩**:** ▲The total aerobic microbial count does not exceed 10^3 cfu/g, and the total combined molds and yeasts count does not exceed 10^2 cfu/g. It meets the requirements of the tests for absence of *Salmonella* species and *Escherichia coli*.▲*NF30*
• **WATER DETERMINATION,** *Method III* ⟨**921**⟩
Analysis: If necessary, cut a sample into pieces from a 2- to 5-mm square, and dry at 105° for 5 h.
Acceptance criteria: The sample loses NMT 20.0% of its weight.
• **ARTICLES OF BOTANICAL ORIGIN,** *Total Ash* ⟨**561**⟩**:** NMT 6.5%, on a dry-weight basis
• **WATER ABSORPTION**
Sample: 5.0 g
Analysis: Place the *Sample* in a 100-mL graduated cylinder, fill to the mark with water, mix, and allow to stand at 25° for 24 h. Pour the contents of the cylinder through moistened glass wool, allowing the water to drain into a second 100-mL graduated cylinder.
Acceptance criteria: NMT 75 mL of water is obtained.

Change to read:

• **BOTANIC CHARACTERISTICS**
Agar: Usually ▲occurs▲*NF30* in bundles consisting of thin, membranous, agglutinated strips or in cut, flaked, or granulated forms. ▲It may be colored▲*NF30* weak yellowish orange, yellowish gray to pale yellow, or colorless. ▲It is▲*NF30* tough when damp, brittle when dry.
Histology: ▲When mounted in water,▲*NF30* Agar appears granular and somewhat filamentous; a few fragments of the spicules of sponges and a few frustules of diatoms may be present. In Japanese Agar, the frustules of *Arachnoidiscus ehrenbergii* Baillon often occur, being disk-shaped and 100–300 µm in diameter.
Powdered agar: White to yellowish white or pale yellow; in chloral hydrate TS, its fragments are transparent, more or less granular, striated, and angular, and occasionally they contain frustules of diatoms.

ADDITIONAL REQUIREMENTS

Add the following:

▲• **PACKAGING AND STORAGE:** Preserve in well-closed containers. No storage requirements are specified.▲*NF30*

Add the following:

▲• **USP REFERENCE STANDARDS** ⟨**11**⟩
USP Agar RS▲*NF30*