AGAR

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SYNONYMS Agar-agar; gelose; Japan agar; Bengal, Ceylon, Chinese or Japanese isinglass; Layor Carang; INS No. 406

DEFINITION Agar is the dried hydrophilic, colloidal substance extracted from certain marine algae of the class Rhodophyceae. It is a polysaccharide, consisting primarily of D- and L-galactose units. About every tenth D-galactopyranose unit contains a sulfate ester group. Calcium, magnesium, potassium or sodium cations are also associated with the polysaccharide.

C.A.S. number 9002-18-0

Assay Not higher than 0.25% for threshold gel concentration

DESCRIPTION Odourless or has a slight characteristic odour. Unground agar usually occurs in bundles consisting of thin, membranous, agglutinated strips, or in cut, flaked, granulated or powdered forms. It may be light yellowish orange, yellowish grey to pale yellow, or colourless. It is tough when damp, brittle when dry. Powdered agar is white to yellowish white or pale yellow.

FUNCTIONAL USES Thickener, stabilizer, emulsifier

CHARACTERISTICS

IDENTIFICATION

Solubility Insoluble in cold water; soluble in boiling water

Gel formation with water Prepare a 1.0% solution of the sample in boiling water in a flask and place the flask in water at 30^{o} for 15 min. A firm, resistant gel is formed. Place the flask in water at 70^{o} for 1 h, the gel is not molten. When heating the flask at higher temperature than 95^{o}, gel is liquefied to form a clear solution.

Precipitate formation with ammonium sulfate solution A warm (40^{o}) 0.5% solution of the sample gives a precipitate with half its volume of a warm (40^{o}) 40% ammonium sulfate solution. This test distinguishes agar from alginates, gum arabic, gum ghatti, karaya gum, pectin and tragacanth.

Precipitate formation with lead acetate solution A warm 0.5% solution of the sample gives a precipitate with one fifth its volume of basic lead acetate TS. This test distinguishes agar from methyl cellulose.

Microscopy Place a few fragments of unground agar or some powder on a slide and add some drops of water or chloral hydrate TS. When examined under a microscope, agar in water appears granular and somewhat filamentous. In chloral hydrate TS, the powdered agar appears more transparent than in water.

PURITY

Water absorption — Place 5 g of 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. Not more than 75 ml of water should be obtained.

Loss on drying (Vol. 4) — Not more than 22% after drying at 105° until the difference between two weighings is less than 1 mg (about 5 h). Unground agar should be cut into pieces from 2 to 5 mm^2 before drying.

Total ash (Vol. 4) — Not more than 6.5% on the dried basis

Acid-insoluble ash (Vol. 4) — Not more than 0.5% on the dried basis

Foreign insoluble matter — Not more than 1%
Boil 5 g of the sample with 500 ml of water and 12 ml of sulfuric acid under a reflux condenser for 2 h. Allow to cool and filter through a tared, fine, sintered glass crucible. Wash flask and filter with 50 ml of water, dry at 105° to constant weight and weigh. Calculate as percentage.

Starch and dextrins — Not detectable
To a warm (40°) 0.5% solution of the sample, add 2 drops of iodine TS. Where the drops fall, a red-violet colour appears. After mixing, the solution should be golden brown and not blue or reddish.

Gelatin and other proteins — Not detectable
To a warm (40°) 0.5% solution of the sample add 1 volume of warm (40°) picric acid TS. No turbidity should appear within 10 min.

Microbiological criteria (Vol. 4) — Total plate count: Not more than 5,000 colonies per gram.
Initially prepare a 10^{-1} dilution by adding a 50 g sample to 450 ml of Butterfield's phosphate buffered dilution water and homogenizing in a high speed blender.
Yeasts and moulds: Not more than 500 colonies per gram
Coliforms: Negative by test
Salmonella: Negative by test

Arsenic (Vol. 4) — Not more than 3 mg/kg (Method II)

Lead (Vol. 4) — Not more than 5 mg/kg
Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, "Instrumental Methods."

METHOD OF ASSAY — Threshold gel concentration: Prepare serial dilutions of the sample with known solids content (0.15%, 0.20%, 0.25%, etc.) and place in tubes, 150 mm long by 16 mm internal diameter, stoppered at both ends. Cool for 1 h at 20-25°. Allow cylinders of gel to slide from the tubes to a level surface. The lowest concentration of gel that resists gravity without rupture for 5-30 sec is the threshold concentration of the sample.