NITROUS OXIDE
(TENTATIVE)

Tentative specifications prepared at the 71st JECFA (2009), published in FAO JECFA Monographs 7 (2009), superseding specifications prepared at the 55th JECFA (2000) and published in the Combined Compendium of Food Additive Specifications, FAO JECFA Monographs 1 (2005). An ADI "Acceptable" was established at the 29th JECFA (1985).

Information is required on a capillary GC method for the assay of nitrous oxide.

SYNONYMS Dinitrogen oxide; Dinitrogen monoxide; INS No. 942

DEFINITION

Chemical names	Nitrous oxide
C.A.S. number	10024-97-2
Chemical formula	N_2O
Formula weight	44.01
Assay	Not less than 99 % (v/v)

DESCRIPTION Colourless, odourless gas

FUNCTIONAL USES Propellant, antioxidant, packaging gas, foaming agent

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4)	1 volume dissolves in 1.4 volumes of water (20° 760 mm Hg). Freely soluble in alcohol; soluble in ether and in oils.
Chromatography	The retention time of the major peak of the sample corresponds to that of nitrous oxide when analysed by gas chromatography using the conditions specified under the method of assay.
Carbon dioxide test	Passes test See description under TESTS

PURITY

Carbon monoxide	Not more than 10 µl/l See description under TESTS
Nitric oxide	Not more than 1 µl/l See description under TESTS

Nitrogen dioxide	Not more than 1 µl/l See description under TESTS
Halogens (as Cl)	Not more than 5 µl/l See description under TESTS
Ammonia	Not more than 25 µl/l See description under TESTS

TESTS

NOTE 1: The carbon dioxide identification test and purity tests are referenced from the Food Chemicals Codex, 6th Edition, 2008, p. 168.
Reprinted with permission from the US Pharmacopeia, 12601 Twinbrook Parkway, Rockville, MD USA 20852.

NOTE 2: The identification and purity tests given below are designed to reflect the quality of nitrous oxide in both its vapour and its liquid phases, which are present in previously unopened cylinders. Reduce the sample cylinder pressure with a regulator. Withdraw the samples for the tests with the least possible release of sample gas consistent with proper purging of the sample apparatus. Measure the gases with a gas volume meter downstream from the detector tubes to minimize contamination of or change to the samples. Perform the tests in the sequence in which they are listed below.

NOTE 3: Detector tubes referenced under identification and purity tests are available from National Draeger Inc., P.O. Box 120, Pittsburgh, PA 15205-0120, USA.

IDENTIFICATION TESTS

Carbon dioxide test	Pass 100 ml of sample gas released from the vapour phase of the contents of the sample gas cylinder through a carbon dioxide detector tube (Draeger CH 30801 or equivalent) at the rate specified for the tube. No colour change occurs (distinction from carbon dioxide).

PURITY TESTS

Carbon monoxide	Pass 1000 ml of sample gas released from the vapour pressure of the contents of the sample gas cylinder, through a carbon monoxide detector tube (Draeger CH 25601 or equivalent) at the rate specified for the tube. The indicator change corresponds to not more than 10 µl of carbon monoxide.
Nitric oxide	Pass 500 ml of sample gas, released from the vapour phase of the contents of the sample gas cylinder, through a nitric oxide-nitrogen dioxide detector tube (Draeger CH 29401 or equivalent) at the rate specified for the tube. The indicator change corresponds to not more than 0.5 µl of nitrogen monoxide.
Nitrogen dioxide	Arrange a sample gas cylinder so that when its valve is opened, a portion of the liquid phase of the contents is released through a piece of tubing of sufficient length to allow all of the liquid to

vaporize during passage through it and to prevent frost from reaching the inlet of the detector tube. Release a flow of liquid into the tubing sufficient provide 500 ml of the vaporized sample plus any excess necessary to ensure adequate flushing of air from the system.

Pass 500 ml of sample gas, released from the vapour phase of the contents of the sample gas cylinder, through a nitric oxide-nitrogen dioxide detector tube (Draeger CH 29401 or equivalent) at the rate specified for the tube. The indicator change corresponds to not more than 0.5 µl of nitrogen dioxide.

Halogens (as Cl)

Pass 1000 ml of sample gas, released from the vapour phase of the contents of the sample gas cylinder, through a chlorine detector tube (Draeger CH 24301 or equivalent) at the rate specified for the tube. The indicator change corresponds to not more than 25 µl.

Ammonia

Pass 1000 ml of sample gas, released from the vapour phase of the contents of the sample gas cylinder, through an ammonia detector tube (Draeger CH 20501 or equivalent) at the rate specified for the tube. The indicator change corresponds to not more than 25 µl.

METHOD OF ASSAY

Determine by Gas Chromatography using the following:

Apparatus

Gas chromatograph fitted with an appropriate gas sampling valve
Stainless steel; 2 m x 2 mm i.d. packed with silica gel for chromatography (250-350 µm)
Column and injector temperature: 60°
Thermal conductivity detector (130°)
Helium at 50 ml/min.
A data station with a suitable chromatography software to operate the instrument
Certified nitrous oxide gas (99.9%)

Procedure

Using a gas sampling valve inject standard gas taken from the liquid phase and record the area under the peak of nitrous oxide. Adjust the injection volume and operating conditions so that a good quantifiable peak for nitrous oxide is obtained (not less than the 35% of the full scale when using an integrator). Record area under the peak of nitrous oxide for the standard. Inject the sample gas taken from the liquid phase and record the area. Calculate the purity of sample gas from the peak areas of standard and sample, and purity of certified nitrous oxide standard.