

## A.II. FLAMMABILITY (GASES)

### 1. METHOD

#### 1.1. INTRODUCTION

This method allows a determination of whether gases mixed with air at room temperature (circa 20 °C) and atmospheric pressure are flammable and, if so, over what range of concentrations. Mixtures of increasing concentrations of the test gas with air are exposed to an electrical spark and it is observed whether ignition occurs.

#### 1.2. DEFINITION AND UNITS

The range of flammability is the range of concentration between the lower and the upper explosion limits. The lower and the upper explosion limits are those limits of concentration of the flammable gas in admixture with air at which propagation of a flame does not occur.

#### 1.3. REFERENCE SUBSTANCES

Not specified.

#### 1.4. PRINCIPLE OF THE METHOD

The concentration of gas in air is increased step by step and the mixture is exposed at each stage to an electrical spark.

#### 1.5. QUALITY CRITERIA

Not stated.

#### 1.6. DESCRIPTION OF THE METHOD

##### 1.6.1. Apparatus

The test vessel is an upright glass cylinder having a minimum inner diameter of 50 mm and a minimum height of 300 mm. The ignition electrodes are separated by a distance of 3 to 5 mm and are placed 60 mm above the bottom of the cylinder. The cylinder is fitted with a pressure-release opening. The apparatus has to be shielded to restrict any explosion damage.

A standing induction spark of 0,5 sec. duration, which is generated from a high voltage transformer with an output voltage of 10 to 15 kV (maximum of power input 300 W), is used as the ignition source. An example of a suitable apparatus is described in reference (2).

##### 1.1.6.2. Test conditions

The test must be performed at room temperature (circa 20 °C).

##### 1.6.3. Performance of the test

Using proportioning pumps, a known concentration of gas in air is introduced into the glass cylinder. A spark is passed through the mixture and it is observed whether or not a flame detaches itself from the ignition source and propagates independently. The gas concentration is varied in steps of 1 % vol. until ignition occurs as described above.

If the chemical structure of the gas indicates that it would be non-flammable and the composition of the stoichiometric mixture with air can be calculated, then only mixtures in the range from 10 % less than the stoichiometric composition to 10% greater than this composition need be tested in 1 % steps.

## 2. DATA

The occurrence of flame propagation is the only relevant information data for the determination of this property.

## 3. REPORTING

The test report shall, if possible, include the following information:

- the precise specification of the substance (identification and impurities),
- a description, with dimensions, of the apparatus used
- the temperature at which the test was performed,
- the tested concentrations and the results obtained,
- the result of the test: non-flammable gas or highly flammable gas,
- if it is concluded that the gas is non-flammable then the concentration range over which it was tested in 1 % steps should be stated,
- all information and remarks relevant to the interpretation of results have to be reported.

## 4. REFERENCES

- (1) NF T 20-041 (SEPT 85). Chemical products for industrial use. Determination of the flammability of gases.
- (2) W.Berthold, D.Conrad, T.Grewer, H.Grosse- einer Standard-Apparatur zur Messung von Explosionsgrenzen'. Chem.-Ing.- Tech. 1984, vo156, 2, 126-127.Wortmann, T.Redeker und H.Schacke. 'Entwicklung