
International Standard



8173

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ATMSI Technical Paper Sect

Light olefins for industrial use — Determination of molecular oxygen in gaseous phase — Electrochemical method with a membrane-covered cell

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Foreword

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Light olefins for industrial use — Determination of molecular oxygen in gaseous phase — Electrochemical method with a membrane-covered cell

0 Introduction

For the determination of traces of molecular oxygen in gaseous olefins, only an electrochemical method with aqueous electrolyte at ambient temperature may be used.

The method by measurement of the paramagnetic susceptibility of the gaseous phase cannot be used on account of lack of sensitivity in the range of contents near 1 ml/m³.

The method by measurement of the electromotive force of a concentration cell with a solid zirconia electrolyte must not be used because of the temperature requirements of 700 to 850 °C.

1 Scope and field of application

This International Standard specifies an electrochemical method for the determination of molecular oxygen in light olefins in the gaseous phase using a membrane-covered electrochemical cell containing a gelled aqueous electrolyte.

The method is applicable to light olefins having an oxygen content greater than 1 ml/m³.

2 References

ISO 6349, *Gas analysis — Preparation of calibration gas mixtures — Permeation method*.

ISO 6377, *Light olefins for industrial use — Determination of impurities by gas chromatography — General considerations*.

ISO 6711, *Gas analysis — Checking of calibration gas mixtures by a comparison method*.

ISO 7382, *Ethylene for industrial use — Sampling in the liquid and the gaseous phase*.

ISO 8563, *Propylene and butadiene for industrial use — Sampling in liquid phase*.

3 Principle

After sampling and preparation of the laboratory sample, passage of the gaseous test portion at a given rate through an electrochemical cell previously calibrated with air or with standard mixtures containing a known amount of oxygen, then measurement of the concentration of oxygen in the gaseous olefin.

NOTE — The measurement of the concentration of the oxygen is based on the following principle:

Specific electrochemical reduction of molecular oxygen after diffusion through a polymer membrane covering the porous cathode.

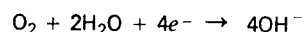
The overall electric current of the galvanic cell is a function of the diffusion process.

The electric current is proportional to the partial pressure of the oxygen in the adjacent gaseous phase, i.e. it is proportional to the oxygen concentration in the gaseous phase at constant total pressure.

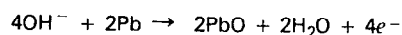
4 Reactions

The electrochemical reactions are as follows:

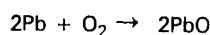
— Cathode reaction



— Anode reaction



— Overall reaction



5 Materials

5.1 Water, deoxygenated and deionized.

5.2 Nitrogen, having an oxygen content less than 5 ml/m³.