International Standard 4901

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Reinforced plastics based on unsaturated polyester resins — Determination of residual styrene monomer content

Plastiques renforcés à base de résines de polyesters non saturés — Détermination du styrène monomère résiduel

First edition — 1985-09-15

UDC 678.674.034 : 543.8 : 547.538.1 **Ref. No. ISO 4901-1985 (E)**

Descriptors : plastics, moulding materials, polyester resins, chemical analysis, determination of content, styrene, gas chromatography.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4901 was prepared by Technical Committee ISO/TC 61, *Plastics*.

Printed in Switzerland

Reinforced plastics based on unsaturated polyester resins — Determination of residual styrene monomer content

1 Scope and field of application

This International Standard specifies a method of determining the residual styrene monomer content in reinforced plastics based on unsaturated polyester resins in the polymerized state (hereinafter called *UP resins in the polymerized state*), by gas chromatography. The residual styrene monomer content is an important criterion in evaluating the degree of cure of UP resins in the polymerized state. This method is not applicable to UP resins of high chemical resistance.

NOTE — If other volatile aromatic hydrocarbon monomers are present in significant quantities, see ISO 2561 for the procedure to be followed in their determination.

This International Standard also specifies a method of determining residual styrene monomer by the Wijs method for laboratories in which gas chromatography is not available.

2 References

ISO 1172, *Textile glass reinforced plastics — Determination of loss on ignition.*

ISO 2561, *Plastics — Determination of residual styrene monomer in polystyrene by gas chromatography.*

3 Determination by gas chromatography

3.1 Principle

Extraction of the styrene from the UP resin in the polymerized state using dichloromethane, followed by determination by gas chromatography.

3.2 Reagents

During the analysis, use only reagents of recognized analytical grade.

3.2.1 Dichloromethane.

3.2.2 Methanol.

3.2.3 ***n*-Butylbenzene.**

3.2.4 Styrene, freshly distilled and stored at 0 °C until used.

When mixed with an equal volume of methanol, the styrene shall give a clear solution.

3.2.5 Polyethylene glycol, relative molecular mass 15 000 to 20 000. (Carbowax, 15 to 20 M, has been found satisfactory.)

3.2.6 Diatomaceous earth, particle size 210 to 250 µm. (Celite, acid-washed grade, has been found satisfactory.)

3.2.7 Helium, hydrogen, and **air,** as carrier and fuel gases for gas chromatography.

For use with the flame ionization detector, nitrogen may be applied as the carrier gas instead of helium.

NOTE — Changes in carrier gas are permissible only if the replacement gas has been demonstrated to give the same results.

3.3 Apparatus

Ordinary laboratory apparatus and

3.3.1 Cutting device, consisting of a water-cooled diamond blade for cutting the UP resin in the polymerized state to strips of width 1 to 2 mm.

3.3.2 Gas chromatograph, with injection port for liquid samples, flame ionization detector, and recorder.

Some other type of ionization detector may be used and, in exceptional cases, a thermal conductivity detector. The latter, however, has lower sensitivity.

3.3.3 Microsyringe, of capacity 1 to 50 µl.

3.3.4 Analytical balance, accurate to 1 mg.

3.4 Preparation of sample

3.4.1 Cutting

Polymerized UP resin pieces of any shape that will permit the production of strips of width 1 to 2 mm may be used. Cut the