

Methods for

Sampling and analysis of glass-making sands

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Society of Glass Technology

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Foreword

This British Standard has been prepared under the direction of the Laboratory Apparatus Standards Committee in close cooperation with the Society of Glass Technology, which has been concerned for many years with standardization of the methods of chemical analysis of glass and of the raw materials and refractories used in its manufacture. The Society published a specification for sands for making colourless glasses in 1935 and revisions were published in 1943 and 1954, the latter edition being used as the basis for the first edition of BS 2975, published in 1958. This standard was reviewed periodically but it was considered that revision was not necessary until the advent of new analytical techniques and reagents justified a complete revision of the analytical procedures. It has now been superseded by BS 2975:1987 and is therefore withdrawn.

In 1974 the Glass Manufacturers' Federation, in collaboration with the suppliers of sand, published revised specifications for the quality requirements for sands for making all types of bulk-production glasses. BS 2975:1958 was concerned only with sands for making colourless glasses, and so this expansion of the specification demanded that the analytical procedures being recommended should also be capable of analysing a wide range of sand compositions. The revised analytical procedures were published by the Society of Glass Technology in 1978 and these procedures have been used in the revision of this British Standard.

The expansion of the quality requirement specifications published by the Glass Manufacturers' Federation to include sands for making a wide range of glass types included many notes on provisos for and reasons why the specified physical and chemical requirements may be varied in certain circumstances. The number of permissible variations is such that it was very difficult to summarize adequately this specification for inclusion in this British Standard. For this reason it was decided to align the format of this standard with that of the sister standard concerning methods for analysing glass, BS 2649.

Analytical methods have not yet been developed by the Society for determining copper, cobalt, nickel and vanadium in sands for making optical and ophthalmic glasses. Until such time as methods are published, it is recommended that these elements be determined by suitable chemical, physical or instrumental techniques of adequate sensitivity.

Five sands of different composition were used in the development of the test procedures described in this British Standard. In order to enable analysts to compare the methods described in this standard with others in use, samples of the five sands may be purchased from the Society (see the note). The analyses of the five sands were examined statistically and the mean composition and limits of error are given for information in Appendix A.

NOTE Society of Glass Technology, "Thornton", 20 Hallam Gate Road, Sheffield S10 5BT.

The principle differences between BS 2975:1958 and this edition are as follows.

- a) Maximum sieve residues are no longer specified although recommendations for the particle size distribution and moisture content for glass-making sands are given in Appendix B.
- b) Chemical compositions are no longer specified although recommendations on the chemical compositions for glass-making sands are given in Appendix C.
- c) The appendix describing "trial melts" is no longer included.
- d) A method for determining loss on heating at 900 °C is included.
- e) A method for the preparation of a solution for the spectrometric determination of calcium, magnesium, sodium and potassium is included.

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Summary of pages

The document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard describes a procedure for sampling from a bulk supply of sand to produce the sample for determining the physical and chemical properties of sands for making colourless and coloured container glasses, glass tableware, borosilicate glass, lead crystal glass, clear flat glass, optical glass and ophthalmic glass and fibre for making insulation glasses. It also describes methods for determining moisture content, particle size distribution, coarse particle content, contamination, silica (SiO_2), loss on heating at 900 °C, iron (as Fe_2O_3), titanium (IV) oxide (TiO_2), aluminium oxide (Al_2O_3), chromium (as Cr_2O_3), calcium oxide (CaO), magnesium oxide (MgO), sodium oxide (Na_2O) and potassium oxide (K_2O).

NOTE 1 As the levels of calcium, magnesium, sodium and potassium present in glass-making sands are often so low as not to be significant, no detailed procedures for their determination are given. For cases where this information is required a solution preparation procedure is described which will allow determinations by flame emission or atomic absorption spectrometry.

NOTE 2 The compositions of the five sands used in the development of these methods are given in Appendix A. Appendix B and Appendix C both contain recommendations relating to glass-making sands: Appendix B covers particle size distribution and moisture content, while Appendix C relates to chemical composition.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Sampling

2.1 Bulk sample

Obtain a sample representative of the delivery as follows.

- In collecting the sample, take separate and approximately equal portions from at least 12 different places, including the top, centre and bottom of the delivery, to produce a sample with a mass of at least 250 g per tonne of sand.
- Immediately after taking the sample, mix the portions well and pack into a suitable container which shall be sealed in order to retain the sand in the "as received" condition until the sample is opened for test (see the note).

NOTE Glass jars, fitted with closures which will not contaminate the sand, or strong sealable polyethylene bags are suitable. Metal containers or closures should not be used.

- The mass of the sample shall be not less than 2.5 kg for delivery loads up to 10 t. In the case of deliveries exceeding 10 t, take a correspondingly larger sample and reduce it to not less than 2.5 kg.

NOTE The method of reduction is the subject of agreement between the supplier and the purchaser.

- In cases where non-friable coarse particles are present or where mineralogical examination is required (e.g. for chromite), obtain a separate 50 kg sample (see 3.3).

NOTE The procedure is the subject of agreement between the supplier and purchaser.

2.2 Preparation of samples for moisture determination

Thoroughly mix the bulk sample (see 2.1) in a suitable dish or other container or on a clean non-absorbent surface.

NOTE 1 A suitable surface is a sheet of glass or stout polyethylene sheet spread on a work-bench or table.

Take 10 separate portions, each of a mass of approximately 2 g, and use the combined sample (mass approximately 20 g) for the determination of the moisture content (see 3.1).

NOTE 2 It is important to determine the moisture content as soon as possible after taking the initial sample to avoid losses of water by evaporation or absorption.

2.3 Preparation of the laboratory sample and samples for inspection, for the determination of particle size distribution and for chemical analysis

NOTE When dry sand is moved or handled there will be some segregation of the different sizes of grain and of the contained minerals. Wetting the sand to between 1 % (*m/m*) and 5 % (*m/m*) water produces sufficient adhesion between the grains to minimize this segregation.

2.3.1 General. Thoroughly mix the material remaining after taking the sample for moisture determination (see 2.2), wetting it if necessary by spraying with water (see the note) so that the sand can be moved freely without balling.

NOTE Water produced by distillation, ion exchange or another suitable method complying with grade 3 of BS 3978 should be used.

Spread the uniformly wetted sand on a non-absorbent surface and distribute it in a layer of uniform thickness. Take a smaller representative sample either by quartering or by taking portions from different parts of the layer. Further reduce the mass of the sample in a similar manner to obtain a laboratory sample with a mass of approximately 1 kg.

2.3.2 Preparation of sample for inspection. Spread the laboratory sample on the non-absorbent surface and smooth into a layer about 10 mm thick. Take portions of about 5 g each from different parts of the layer, to obtain a sample with a mass of about 500 g.

2.3.3 Preparation of sample for particle size analysis. Prepare a sample with a mass of approximately 100 g from the laboratory sample using the method described in 2.3.2.