Australian Standard®

Paints and related materials—Methods of test

Method 301.2: Non-volatile content by volume (volume solids)

PREFACE

This Standard was prepared by the Standards Australia Committee on Paints and Related Materials, under the direction of the Chemical Standard Board, to supersede the 1978 edition. The revision was instigated by Victorian Railways (VICRAIL) and manufacturers of paint, who had experienced practical difficulties in obtaining precision and reproducibility when the 1978 edition was used in normal product specifications.

This Standard is substantially the same as that issued in 1978, however, it recognizes that flat paints and highly pigmented paints are susceptible to poor results due to their ability to entrap air in the film, and it overcomes this problem by subjecting the film to a vacuum prior to determining the dry paint film volume.

FOREWORD

An investigation by VICRAIL resulted in a complete revision of the standard method (the *disc* method) and a proposal for an alternative method (the *dish* method). The proposed new method, which was tested by interlaboratory trials, demonstrated a significant reduction of the factors causing previous discrepancies (e.g. lack of control over wet film thickness and air entrapment in the test coating) and resulted in greatly improved precision.

Although limited interlaboratory trials suggest it gives better reproducibility, because it is a new method of increased complexity, the VICRAIL *dish* method is included in Appendix A as a test method which may be more suited to certain critical situations. The modified *disc* method provides sufficient accuracy to meet the needs of industry and consumers in most situations, and is retained as the reference method.

When evaluating flat and low gloss products, unless the product specification states otherwise, it is considered essential to carry out the evacuation procedure described in Clause 8.2(i). Trials have shown that failure to follow this procedure results in poor reproducibility.

METHOD

1 SCOPE This Method describes a procedure for determining the non-volatile matter, as percent by volume, in paints and related materials for a specified wet film thickness, under prescribed conditions. It includes an evacuation stage necessary for flat and low-gloss products to ensure the removal of entrapped air, voids and volatile inclusions.

NOTES:

1. The value obtained by this Method takes into account any chemical or physical changes that have occurred in the paint during drying, and may not be the same as that calculated on the basis of addition of the masses and volumes of the raw materials in the formulation.
2. Appendix A provides an alternative method (the *dish* method) which limited interlaboratory trials indicate will result in improved reproducibility.

2 REFERENCED DOCUMENTS. The following documents are referred to in this Standard.

AS

1580	Paints and related materials—Methods of test
1580.101.4	Method 101.4 Conditions of test, temperature controlled
1580.102.1	Method 102.1 Sampling procedure
1580.103.1	Method 103.1 Preliminary examination and preparation for testing
1580.202.1	Method 202.1 Density
1580.202.2	Method 202.2 Density of water-dispersed paints subject to foaming
1580.301.1	Method 301.1 Non-volatile content
1580.602.2	Method 602.2 Specular gloss
2831	Thermometers—Solid stem—Long and short—For precision use
2850	Chemical analysis—Interlaboratory test programs—For determining precision of analytical method(s)—Guide to the planning and conduct.

3 DEFINITION. For the purpose of this Standard, the definition below applies.

Flat paint—a highly pigmented coating material whose pigment volume nominally exceeds 50 percent; for example, interior wall paints and zinc-rich primers.

4 PRINCIPLE. A disc of specified dimensions, which has been previously weighed in air, is weighed while immersed in a liquid of known density, and its volume is determined. The disc is then cleaned and dried, and uniformly coated with the test paint. After conditioning in an oven for a specified period, the coated disc is weighed in air and its volume determined by weighing in the immersion liquid; if the test paint is a flat or low gloss paint, or if it is suspected that entrapped air or voids are present, the disc is immersed in liquid in an evacuated environment prior to the final weighing. The non-volatile content (by mass) and the density of the test material are determined and the resulting data are used to calculate the non-volatile content (by volume) of the test material.

5 APPARATUS.

5.1 Apparatus for density determinations—the apparatus specified in AS 1580.202.1 or AS 1580.202.2, as appropriate, for the determination of the densities of the immersion liquid (ϱ_1) and the test material (ϱ_T).

5.2 Apparatus for non-volatile content (by mass) determination—the apparatus specified in AS 1580.301.1 for the determination of the non-volatile content, by mass (NVC_{mass}), of the test material.

5.3 Cutting blade—sufficiently sharp to easily puncture blisters which may form in the cured film. A razor blade is suitable.

5.4 Disc(s)—a flat disc of nominal diameter 60 mm and thickness 0.7 mm, manufactured from tinplate or other material inert to, but able to be readily coated by, the immersion liquid and the test paint. The disc shall be pierced with a small hole of nominal diameter 0.5 mm near its edge to permit it to be hung by a suspension wire at various stages of the test.

5.5 Evacuation chamber—fitted with means to admit immersion liquid. It shall be connected to a pressure-measuring device. A suitable arrangement is shown in Figure 1.

5.6 Immersion container (See Figure 2)—to immerse the disc without fouling the sides of the container and which may be accommodated in the balance case. The container shall be made of a material inert to the immersion liquid.

NOTE: A laboratory beaker should suffice.

5.7 Immersion liquid—of known density (ϱ_1) at the test temperature (T_1), which remains stable for the duration of immersion of the sample disc, and is inert to, and does not dissolve, the test material. Where vacuum treatment is required, the density shall also remain stable throughout the treatment. If the density of the liquid at the test temperature is not known, it shall be determined to the nearest 0.1 kg/m^3 in accordance with As 1580.202.1 or other cited method of at least equivalent accuracy.

NOTE: Water (containing a small amount of wetting agent), mineral spirits or kerosine is generally suitable.

5.8 Oven—fan-forced ventilated, capable of maintaining a temperature of 105 ±3°C.

NOTE: For stoving materials or materials in which the binder suffers loss of mass or the pigment evaporates at the test temperature, other drying conditions may be specified.