INTERNATIONAL STANDARD

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Adhesives — Evaluation of the effectiveness of surface treatment techniques for aluminium — Wet-peel test by floating-roller method

Adhésifs — Évaluation de l'efficacité des techniques de traitement de surface de l'aluminium — Essai de pelage humide par la méthode des galets mobiles

Reference number
ISO 14676:1997(E)

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 14676 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

It is similar, but not technically identical to, ENV 1967:1995.

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Introduction

This test has been developed to assess pretreatments for aluminium and is intended for laboratory evaluations. The object was to find and develop a rapid test possessing high sensitivity which could differentiate between pickling pretreatments: complete chromic acid anodisation (CAA)/phosphoric acid anodisation (PAA) processes and incomplete ones. The application of water containing a wetting agent changes the mode of failure from cohesive failure, usually found in dry joints, to quasi-adhesive failure. The latter is associated with a corresponding reduction in the complete CAA or PAA process. The failure mechanisms in the boundary layer zone initiated by this test are mainly explained by the diffusion of water. The wetting agent essentially improves the surface wetting.

This test is considered to be unsuitable for long-term durability prediction. It is expected that if this severe test is applied to less stable joints it will cause mainly adhesive failure. As a consequence, the test loses its ability to differentiate effectively in such circumstances. However, the applicability to other materials and surface pretreatment methods has not been investigated in detail.

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Adhesives — Evaluation of the effectiveness of surface treatment techniques for aluminium — Wet-peel test by floating-roller method

1 Scope

This International Standard is applicable to the evaluation of the quality of a surface treatment of aluminium or its alloys for high-strength adhesive bonding.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to use the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4578:–[1], *Adhesives – Determination of peel resistance of high-strength adhesive bonds – Floating-roller method.*

ISO 4588:1995, *Adhesives – Guidelines for the surface preparation of metals.*

ISO 9142:1990, *Adhesives – Guide to the selection of standard laboratory ageing conditions for testing bonded joints.*

ISO 10365:1992, *Adhesives – Designation of main failure patterns.*

3 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1 peel resistance: See ISO 4578.

3.2 wet-peel resistance: Peel resistance after application of water containing a wetting agent to the crack opening.

1) To be published. (Revision of ISO 4578:1990)

4 Principle

The floating-roller method is used to determine the peel resistance and the wet-peel resistance of adhesive bonds between a rigid metal adherend and a flexible metal adherend. Complete CAA or PAA pretreatment will not show any practical difference between the peel resistance and the wet-peel resistance, while incomplete pretreatment will show a corresponding reduction in wet-peel resistance compared with the peel resistance.

Note — There are indications that the floating roller may produce more constant numerical data than other peel methods. However, it should not be expected that the flexible metal adherend will conform to the surface of the roller.

5 Apparatus

5.1 Tensile testing machine

See ISO 4578, subclause 5.1.

5.2 Peel test fixture

See ISO 4578, subclause 5.2 and figure 1.

6 Test specimens

See ISO 4578, clause 6 and figure 2.

7 Conditioning and testing atmosphere

The specimens shall be conditioned and tested in one of the standard laboratory atmospheres specified in ISO 9142.

8 Procedure

8.1 Insert the specimen in the peel test fixture (5.2) as shown in ISO 4578, figure 1, with the unbonded end of the flexible adherend gripped in the jaw of the testing machine (5.1). Peel the specimen at a constant crosshead separation rate of 100 mm/min +/- 5 mm/min, unless otherwise specified.

Note — If the rigid adherend bends or is distorted during the test, it is recommended that the specimen be redesigned with a rigid adherend stiff enough to ensure even peeling.

8.2 Stop the crosshead after peeling approximately 75 mm of the bonded length. Then apply several drops of water containing a wetting agent to the crack opening (total volume 1 ml +/- 0,5 ml).

Note — The solution may typically contain between 0,5 % and 1% of detergent.

8.3 Commence the peeling immediately after the application of the water containing the wetting agent. Continue the test until the specimen is peeled completely.

8.4 Make an autographic recording of force versus crosshead movement (force versus distance peeled).

8.5 Disregard the results if failure occurs outside the peeling zone as defined in ISO 4578, figure 1.

9 Expression of results

Determine, from the autographic curve, the average peeling force, in kilonewtons per metre of specimen width, required to separate the adherends, for the dry peeling zone and for the wet peeling zone, over a distance of at least 55 mm in both cases. Disregard the first 20 mm and the last 20 mm of the record and the first 10 mm of the wet-peel zone. The average force may be determined from the curve by one of the following methods:

a) by using a planimeter;

b) by drawing the best straight line through the peeling curve using a straight edge.

Also record the maximum and minimum forces for each invidual specimen.

10 Precision

The precision of this test method is not known because inter-laboratory data are not available. When inter-laboratory data have been obtained, a precision statement will be added at the following revision.

11 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) all details necessary for complete identification of the adhesive tested, including type, source, manufacturer's code number, batch or lot number, form, etc.;

c) all details necessary for complete identification of the adherends, including material, thickness, width and surface preparation;

d) a description of the bonding process, including the method of application of the adhesive, the drying or pre-curing conditions (where applicable), and the curing time, temperature and pressure;

e) the average thickness (as precisely as practical) of the adhesive layer after formation of the bond;

f) a complete description of the specimen: whether individually prepared or cut from a panel, including the dimensions and construction of the specimen, the conditions used for cutting individual specimens, the number of test panels represented and the number of individual specimens (when edge specimens are tested they shall be designated "edge specimens");

g) the conditioning procedure used prior to testing and the conditions used from ISO 9142;

h) the type and concentration of the detergent used;

i) the crosshead separation rate, if other than 100 mm/min;

j) the method used to determine the average peeling force;

k) the average, maximum and minimum peeling-force values, in kilonewtons per metre of specimen width, for each individual specimen (edge specimens shall be reported separately), in each case for both dry and wet peeling;

l) the type of failure for both the dry and the wet peel area, in accordance with ISO 10365.

ICS 83.180

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