GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW4795

Determination of Coating Mass and Iron Content of Galvanneal Coated (Zn/Fe Alloy) Steel Sheet

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This test procedure is used in the determination of the coating mass and composition of galvanneal coating (Zn/Fe alloy) on sheet steel.

1.2 Applicability. This standard applies to sheet steel with galvanneal coating (Zn/Fe alloy).

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. Usual laboratory equipment:

3.2.1 Galvanostat/Potentiostat.

3.2.2 Reference Electrode Ag/AgCl (KCl sat.).

3.2.3 Auxiliary Electrode (Platinum Electrode).

3.2.4 Fourth Electrode (Platinum Electrode).

3.2.5 Luggin Capillary.

3.2.6 Glass cell to adapt the electrodes and sample.

3.2.7 Connection cable between electrodes (Reference and Fourth).

3.2.8 ICP Atomic Emission Spectrometer (ICP-AES) or atomic absorption spectrometer.

3.3 Test Vehicle/Test Piece. Test sample size shall be 2000 mm^2 minimum with a preferred sample size of 3330 mm^2 (57.7 ± 0.1 mm square or 65.1 ± 0.1 mm in diameter).

3.3.1 Reagents.

Note: Use only analytical grade reagents and only distilled water, or water with equivalent purity.

3.3.1.1 Ammonium sulfate ($(NH_4)_2SO_4$) solution, 0.5 M.

3.3.1.2 Nitric acid (HNO_3) solution, 10% (v/v).

3.3.1.3 Hexamethylenetetramine.

3.3.1.4 Concentrated hydrochloric acid.

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3.3.1.5 Acetone.

3.3.1.6 Distilled water.

3.4 Test Time.

Calendar time:	0 d
Test hours:	2 h
Coordination hours:	1 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. Strip the sample until total dissolution of the coating is achieved. Analyze the solution (containing zinc and iron from the dissolved coating) using instrumental or wet analytical methods.

4.1.1 Method A. Electrochemical stripping with ammonium sulfate solution and electrochemical control.

4.1.2 Method B. Chemical stripping with hydrochloric acid plus inhibitor and visual control.

4.1.3 Test Sample Preparation.

4.1.3.1 Method A: Electrochemical Dissolution. Cut the test samples in ribbons at least 5 cm from the edge of the sheet (as shown in Figure 1).

Clean the specimens with acetone to remove impurities.

Weigh the specimens to the nearest 0.001 g.

Record the obtained weight.

4.1.3.2 Method B: Weigh-Strip-Weigh. Cut the test samples as shown in Figure 1. Mark one side of the test specimen and consider it as the “superior side”.

Clean the specimen with acetone to remove impurities that can interfere during the stripping process.

Weigh the specimen to the nearest 0.001 g.

Record the obtained weight.

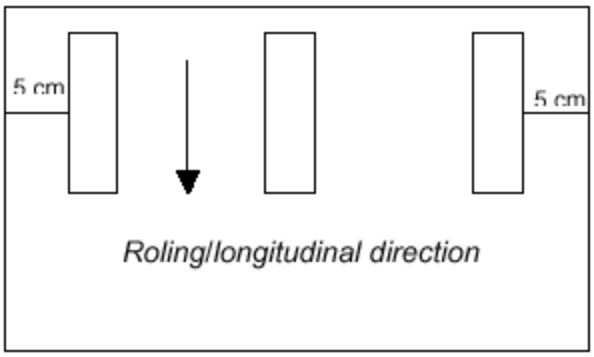

Figure 1: Relationship of Test Samples to Rolling Direction

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Method A: Electrochemical Dissolution. Fasten the sample (work electrode) in the glass cell used for electrolysis.

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