

User Guide

Elcometer 139

Amine Blush Swab Test Kit

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Manufactured exclusively for Elcometer by Abraxis LLC, 54 Steamwhistle Drive, Warminster, PA 18974, USA.

Box dimensions: 172 x 110 x 100mm (6.75 x 4.25 x 4.00"). Weight: 350g (12.3oz).

A Material Safety Data Sheet is available to download via our website, www.elcometer.com/images/MSDS/elcometer_139_amine_blush_swab_test_kit.pdf

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Patent Pending

1 BOX CONTENTS

The Elcometer 139 is supplied in a cardboard box which has been designed to act as a work station and contains:

- 20 x Polystyrene Sampler Test Tubes (white caps) of 1.0ml (0.035fl oz) buffer solution
- 1 x Test tube (green cap) of Diluent Part A solution
- 1 x Test tube (blue cap) of Diluent Part B solution
- 2 x Diluent Transfer Pipettes (green & blue)
- 3 x Test Part A dropper bottles (green cap) - containing ACh-E powder (freeze dried)
- 3 x Test Part B dropper bottles (blue cap) - containing ATC powder (freeze dried)
- 1 x Test Part C dropper bottle (yellow cap) - containing Chromogen DTNB solution
- 1 x Bottle of Swab Solution - containing 25ml (0.89fl oz) of rubbing alcohol (70% IPA)
- 20 x Cotton Swabs (q-tips)
- 2 x Swab Templates - 2.54 x 2.54cm (1 x 1")
- 1 x Pair of Tweezers
- 1 x Re-sealable plastic bag for content disposal
- 1 x User Guide

2 GENERAL DESCRIPTION

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The Elcometer 139 Amine Blush Swab Test Kit is a rapid colorimetric test designed solely for the use in the quick and immediate qualitative identification of amine blush (carbammates) on the surface of coatings using surface swabs. The presence of amine blush is indicated by a visual change of colour of the test solution vs a control sample. The Elcometer 139 simply determines whether amine blush is or is not present on the coating's surface, it does not in anyway quantify the degree of amine blush present. For more information see Section 7 on page 6.

3 TEST PRINCIPLE

The Elcometer 139 Amine Blush Swab Test is a qualitative, colorimetric assay (a modification of the Ellman Method) for the detection of carbammates, based on the inhibition of the enzyme Acetyl Cholinesterase [ACh-E]. ACh-E hydrolyses acetylthiocholine [ATC], which reacts with 5,5'-Dithio-bis(2-Nitrobenzoic Acid) [DTNB], to produce a yellow colour which is compared to a control sample visually or using a colorimeter at 405-450nm

4 SAFETY & STORAGE INSTRUCTIONS

Discard samples and reagents according to local, state and federal regulations.

The Elcometer 139 Amine Blush Swab Test Kit should be stored in a cool place, out of direct sunlight, at temperatures between 4 - 28°C (39 - 82°F). During testing, samples should be brought to room temperature, 10 - 30°C (50 - 86°F), before use.

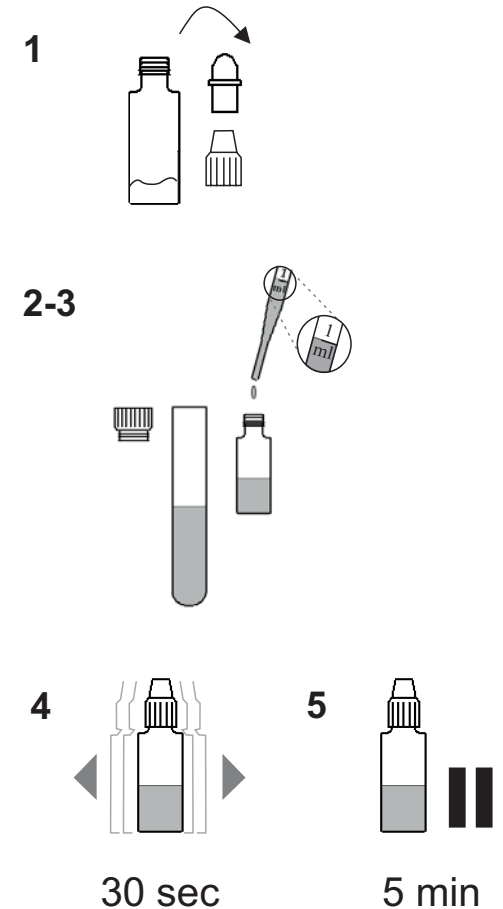
5 PREPARING TEST PART A (GREEN) AND TEST PART B (BLUE) SOLUTIONS

In order to maximise product lifetime, Test Parts A and B are supplied from the factory in a freeze dried state and therefore need to be diluted using the appropriate diluent and transfer pipette. In order to avoid contamination, the Test Parts, Diluent Parts and pipettes are colour coded.

- Whilst preparing **Test Part A**, use the **GREEN** colour coding
- Whilst preparing **Test Part B**, use the **BLUE** colour coding

To prepare Test Part A (green):

- 1) Remove the green bottle cap and dropper tip from the Test Part A bottle
- 2) Using the 1ml marker as a guide, remove 1ml of Part A Diluent - green capped tube, using the appropriately colour coded transfer pipette
- 3) Add the 1ml Diluent into the appropriate Test Part A bottle
- 4) Replace the dropper tip and bottle cap and shake the diluted Test Part A bottle moderately for about 30 seconds.
- 5) Wait at least 5 minutes before using the prepared Test Part A Solutions.



To prepare Test Part B (blue):

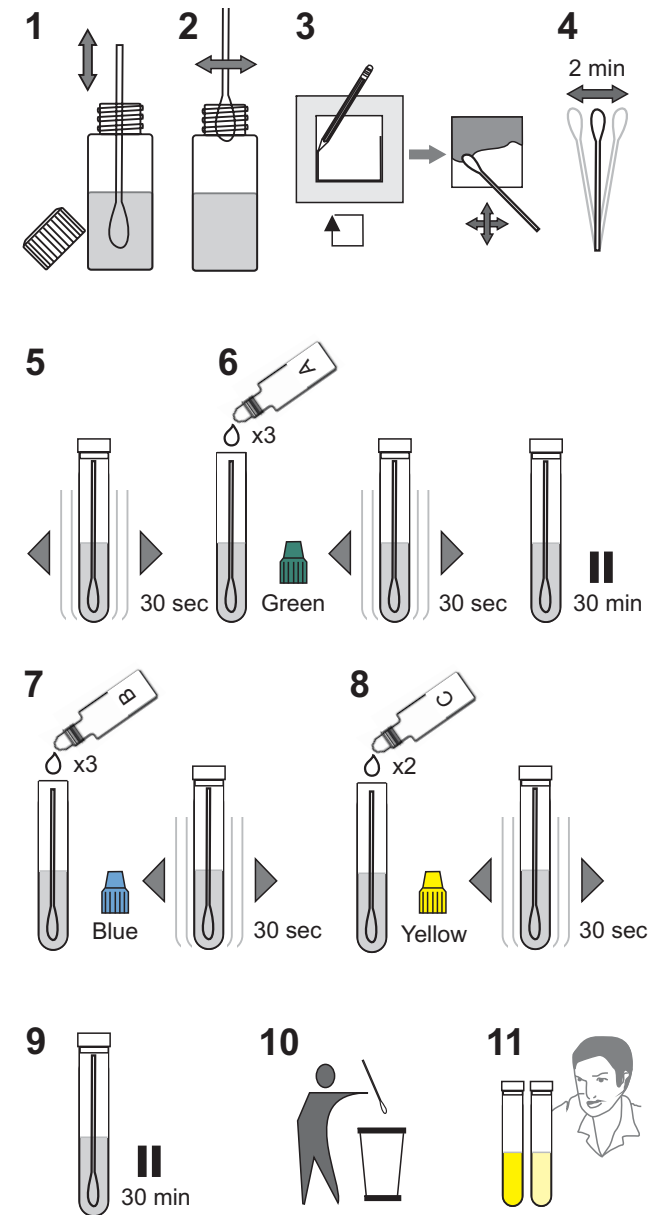
Follow steps 1-5 above using the blue colour coding

6 TAKING A SWAB SAMPLE

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Note: *A comparison control sample should be created by following steps 1, 2 & 4-11, below*

- 1 Dip the cotton portion of a Cotton Swab (q-tip) into the Swab Solution bottle
- 2 Remove excess by rolling cotton tip on the inside of the bottle
- 3 For each sample, using the Swab Template as a guide, swab a 2.5 x 2.5cm (1 x 1") area
- 4 Wave the Cotton Swab in the air until dry (about 2 minutes)
- 5 Place the Cotton Swab into a Sampler Test Tube, replace the top and shake for 30 seconds
- 6 Add 3 drops of Test Part A (green cap), shake for 30 seconds and incubate (rest) the sample for 30 minutes at room temperature 10 - 30°C (50 - 86°F), avoiding direct sunlight.
- 7 Add 3 drops of Test Part B (blue cap), shake for 30 seconds
- 8 Add 2 drops of Test Part C (yellow cap), shake for 30 seconds
- 9 Incubate (rest) the sample for 30 minutes at room temperature, avoiding direct sunlight
- 10 Remove and environmentally dispose of the Cotton Swab
- 11 Visually compare the results to the control sample within 10 minutes of test completion: **Amine blush is present if there is a detectably lower intensity of yellow colour observed in the test sample as compared to the control sample.**



7 THE IMPORTANCE OF AMINE BLUSH DETERMINATION

Amines and amine functional amides are one of the most common curing agents for high performance epoxy coatings. In coating applications, amine cured epoxy formations generally can be cured at room temperature to yield films with high mechanical strength; good water, chemical and corrosion resistance, as well as excellent adhesion properties.

When using amine cured epoxy resin coatings in a multi-layer system, if the original coating cures in a low ambient temperature and / or in a high humidity environment, problems - referred to in the industry as amine blush - can develop. Amines that have migrated to the coating surface can react with the carbon dioxide (CO₂) present in the air, ultimately resulting in the formation of carbamates (amine blush) on the surface of the epoxy coating.

The presence of carbamates can lead to inter-coat adhesion failures if the film is re-coated.

It is therefore important to determine if the coating exhibits the phenomenon of amine blush when:

- 1 Determining if an amine cured epoxy coating can be over coated
- 2 Analysing why an epoxy coating could not be successfully over coated

Amine blush can sometimes (but not often) be visible to the naked eye - appearing as a thin spotty or greasy layer ranging in colour from white to amber



The Elcometer 139 Amine Blush Swab Test Kit is a qualitative test and is not an indication of the amount of amine blush present on the surface. This test is extremely sensitive and may detect even minor amounts of amine blush. The coatings industry has not yet established the critical threshold for the amount of amine blush that will cause inter-coat delamination.

If a positive result is obtained, the user should contact the coating manufacturer to determine whether additional surface treatment is required prior to application of subsequent coats.

Note: Laboratory analysis such as infrared spectroscopy can be used as a method to determine whether amine blush (carbamates) are present.

9 LIMITATIONS / POSSIBLE TEST INTERFERENCE

Numerous organic and inorganic compounds commonly found in samples have been tested and found not to interfere with this test method. Due to the high variability of compounds that may be found in surface samples, however, test interferences by matrix effects cannot be completely excluded. Mistakes in handling the test can also cause errors. Possible sources for such errors include:

- Inadequate storage conditions of the test kit - the test kit should be stored at temperatures between 4 - 28°C (39 - 82°F)
- Too long or too short a incubate or rest time (incubate time: 30 minutes)
- Leaving the test during incubation in direct sunlight
- Extreme temperature swings during testing