

## **Intermediate Module 319**

### **Evaluation of paints–Physical Properties**

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This module provides details and test procedures relating to the evaluation of paints once applied to 'standard' panels. Most of the tests will be carried out in the Paint Manufacturer's laboratory, although some customers may wish to confirm the property during production of their finished articles.

A list of desirable physical properties is explained, with a discussion on how to prepare for and carry out suitable tests. The student will have an opportunity to carry out some of these.

## **Evaluation of Paints – Physical Properties**

### **Introduction**

#### **1. Module Prerequisites**

The main prerequisite for persons taking Modules at Intermediate level is an interest in surface coatings. Preferably, they will be employed in the coatings or a related industry.

In addition, they should preferably have a basic education in chemistry and physics.

#### **2. Introduction to Module 319**

Module 319 is one of a series of modules at Intermediate level. Following successful completion of this module, you may proceed to study further modules, selected on the basis of your needs. There is also a series of modules at Advance level, which you may wish to study at a later stage

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#### **3. Structure of the module**

The module is designed to take approximately 12 hours of study made up of:

- theory block: 9 hours
- practical work: 3 hours

This time excludes the time taken to write up your reports for the practical attendance exercises.

The theory block is split into four sections which are not of equal length but should take, on average, up to 2 hours to go through each section including figures that you should refer to as you go through the material.

A number of Self-Assessed Questions (SAQs) are included for you to answer as you work through the text. The answers to these are given at the end of the module in Appendix 1.

Two Practical Attendance Exercises' (PAXs) are included in Appendix 2 and to gain maximum benefit from the course these should be carried out. If you have any problems with these, discuss alternatives with either your counsellor or tutor.

A computer-marked assessment (CMA) consisting of 10 multi-choice questions is included in the course, the answers to which should be entered on the website.

#### 4. Practical Exercises

PAX 1 Adhesion of paints. (20% of marks)

PAX 2 Hardness of paints. (15% of marks)

These will be found in Appendix 2.

#### 5. Assessment

**CMAs'** must be attempted by all persons taking the course.

**TMA**, A written test of 30 minutes duration, is taken under examination conditions. This test is optional for candidates wishing to simply study the material, but it is mandatory for those wishing to receive a certificate. Students may, if they wish, await their completion of three modules before sitting the TMA papers. By 'stacking' tests in this way they will only need to attend their test centre once instead of three times.

For students completing all assessments, the maximum possible marks for this module are 100 made up of the three elements.

CMA	20
TMA	45
PAX	35

An overall mark of 50% or more is necessary for successful completion of the module, with students achieving at least 40% of the marks available in each element

#### 6. Objectives

##### Section 1. How and why to test for physical properties

After studying this section, you should be able to:

- 1.1 List the physical properties of films as including adhesion, hardness, flexibility, scuff-resistance, slip or non-slip, brightness, degree of gloss etc.
- 1.2 Differentiate between tests appropriate for quality control, new formulations, and customer specifications.
- 1.3 Discuss testing as a basis for a selection of coatings for particular applications.
- 1.4 Explain the relationship between opacity, hiding power, contrast ratio, and covering power.

## **Section 2. Test panels – selection and preparation**

2.1 Select panels (steel, aluminium, tin plate, glass, wood, plastic film) appropriate to the property being tested.

2.2 Discuss standard methods for:

- a) solvent cleaning of test surfaces,
- b) burnishing test surfaces,
- c) chemically treating aluminium surfaces,
- d) preparing glass panels.

2.3 Discuss the importance of careful handling of test specimens after cleaning and pre-treatment.

## **Section 3. Adhesion, hardness and flexibility**

3.1 Be familiar with the methods which determine the degree of adhesion, i.e. cross-cut and pull-off techniques.

3.2 Contrast the method of resistance to shock impact (falling weight) with the method of determining resistance to slow deformation (cupping test).

3.3 PAX 1. Compare the adhesion of paints after application and curing on a steel surface:

- a) contaminated with grease
- b) prepared according to BS EN ISO 1514
- c) that has been phosphated using methods laid down in BS EN ISO 6272 - 1, BS EN ISO 1520 and BS EN ISO 2409

3.4 Explain the merits of using bend test mandrels to test the flexibility of paints and cite the influence of temperature on flexibility.

3.5 PAX2. Measure the hardness of coatings using:

- a) rocker or pendulum damping methods,
- b) scratch test methods.

Make a critical comparison of the methods used above.

**NB: Please note that this can be done as a thought experiment. Please describe what may happen with different coatings. (Details can be found from web searches)**

## **Section 4. Properties of Coatings**

4.1 Discuss methods by which the electrical strength of varnish films can be determined

4.2 Describe a method that examines the flexibility of clear finishes for wood, which need to resist an extreme range of temperatures.

4.3 Outline briefly the use of a colourimeter and a spectrophotometer for assessing any colour changes in an ageing film.