

Intermediate Module 329

Application – Metal Substrates

Author: P.A. Fryer

Updated by Dr T Sayer, M Griffiths

Module 329 is an Intermediate module following on from the Foundation Module 206 on Surface Preparation. In Module 206 a study of the features of a surface and contaminants on the surface of a substrate was made. In Module 329 the processes of chemically cleaning a metal surface and its subsequent chemical pretreatment is considered in more detail, together with some review of the mechanical methods of cleaning metals.

Prerequisites for Module 329

- (a) You should have studied some science at GCSE or GNVQ at an appropriate level;
- (b) You are recommended to have studied module 206: Surface Preparation or equivalent material;
- (c) You should currently be employed in coatings or a related industry.

Structure of the Module

	Est. Study Time
Section 1: Review of Basics of Surface Preparation	0.5 hr
Section 2: Surface Cleaning by Degreasing	2.0 hr
Section 3: Surface Cleaning by Treatment with Acids and Alkalis	1.0 hr
Section 4: Chemical Pretreatments	4.5 hr
PAX on pretreatment	2.0 hr
Computer-marked assessment	0.5 hr
Tutor-marked assessment	0.5 hr

Assessment within the Module

Self Assessment Questions (SAQ)	0%
Practical Exercise (PAX) on pretreatment	35%
Computer-marked assessment (CMA)	20%
Tutor-marked assessment	45%

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.

Module Objectives

Assessment within the Module Objectives

On successful completion of this module you will be able to:

Section 1: Review of the Basics of Surface Preparation

- 1.1 Explain why it is necessary to remove contaminants from a surface prior to pretreating and coating a surface;
- 1.2 State the mechanical methods of removing surface contaminants and the substrate situation where each is used;

Section 2: Surface Cleaning by Degreasing

- 2.1 Explain the basic principles involved in degreasing
- 2.2 Describe the construction and operation of:
 - a) a vapour degreasing bath
 - b) a liquid degreasing bath
 - c) a spray degreasing unit.
- 2.3 Describe in practical terms the process of vapour degreasing and the wettability of the surface produced
- 2.4 State the advantages and disadvantages of trichloroethene as a degreasing fluid.

Section 3: Surface Cleaning by Treatment with Acids and Alkalis

- 3.1 Describe the use of acid pickling for the removal of mill scale and state the function of inhibitors.
- 3.2 Describe the process of alkaline cleaning and the importance of thorough rinsing to remove soluble salts.
- 3.3 Describe in practical terms the process of alkaline cleaning and the wettability of the surface produced

Section 4: Chemical Pretreatments

- 4.1 State two advantages gained by carrying out chemical pretreatments of metal substrates and select the most appropriate pretreatment for mild steel and aluminum.
- 4.2 State the main chemical characteristics of iron, manganese and zinc phosphate coatings.
- 4.3 Draw a labelled diagram of a process for phosphating steel work-pieces.
- 4.4 Distinguish between heavyweight, mediumweight and lightweight phosphate coatings, as defined in BS 3189:91.
- 4.5 Compare the effectiveness of various weights of phosphate treatment as a protection against corrosion and as a means of improving adhesion (PAX).
- 4.6 Describe the process of chromating
- 4.7 Describe the process of anodising.
- 4.8 Relate the use of phosphating, chromating and anodising to types of metal substrates encountered in industrial finishing.
- 4.9 State the effect of phosphating, chromating or anodising aluminum on the adhesion of a clear acrylic coating.