



Australian Government

Department of Education, Employment and Workplace Relations

PMBTECH401B Predict polymer properties and characteristics

Revision Number: 1

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Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers the ability to apply a knowledge of polymer morphology, the properties of polymers in relation to their morphology, physical failure in polymers and test methods for polymeric materials to predict polymer properties and processing characteristics. It applies to all sectors of the industry.

This competency is typically performed by technicians working either independently or as part of a work team.

Application of the Unit

Application of this unit

This competency applies to technicians who use an understanding of polymer morphology to explain polymer properties in terms of phase diagrams, to predict polymer properties, and to organise and interpret tests on polymers.

It includes:

- polymer phase change such as glass transition
- property changes due to processing conditions
- physical failure causes
- test method principles
- the relationship of test results to polymer properties and uses.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit of competency has a prerequisite of *PMB TECH 301A Use material and process knowledge to solve problems*.

Employability Skills Information

Employability Skills

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT ELEMENT	PERFORMANCE CRITERIA Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
1. Predict the impact of processing conditions on polymer properties.	1.1 Predict property changes due to molecular weight and temperature. 1.2 Identify the glass transition temperature and melting point relative to ambient temperature. 1.3 Describe the morphological changes occurring to polymers as the temperature is raised to typical moulding conditions. 1.4 Describe the effect of cooling rate on polymer morphology. 1.5 Predict potential product dimension/shape changes due to internal stresses resulting from molecular orientation. 1.6 Determine the affect of post-mould annealing on the degree of crystallisation and crystal.
2. Predict physical properties of polymers from their morphology.	2.1 Predict the effects on physical properties of: <ul style="list-style-type: none"> • temperature • crystal size • degree of crystallisation • molecular orientation 2.2 Predict shrinkage from morphology.
3. Determine likely physical failures of polymers.	3.1 Determine impact of physical use conditions on physical failure. 3.2 Determine impact of polymer characteristics on physical failure.
4. Organise and interpret polymer tests.	4.1 Describe melt flow properties from flow data. 4.2 Choose appropriate test type to measure desired criteria. 4.3 Specify relevant standard test method. 4.4 Interpret test result, making allowance for possible variations in test.

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit. Knowledge and understanding of the morphology of polymers sufficient to predict common physical properties and behaviours and to interpret test results, allowing for normal variations in data. Knowledge of organization standard procedures and work instructions, relevant regulatory requirements and standard international and national test methods, along with the ability to implement them within appropriate time constraints and in a manner relevant to the job.

Knowledge as a basis for solving processing and material problems including:

- polymer morphology using phase diagrams
- properties of polymers in relation to their morphology
- physical failure in polymers
- polymer materials test methods and property data
- changes in properties and variations in test data
- changes in physical properties due to compounding, processing or environmental conditions

Language, literacy and numeracy requirements

This unit requires the ability to read and interpret technical literature and standard test methods. High level numeracy is also required, particularly graphical interpretation skills and data interpretation

Numeracy is required to be able to determine sizes, angles and shapes.

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the assessment guidelines for this training package.

Overview of assessment

A holistic approach should be taken to the assessment.

Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that the morphology be understood and that the importance of critical material properties and quantities is known. Competence must be demonstrated in the ability to interpret polymer properties from their morphology.

Consistent performance should be demonstrated. For example, look to see that:

- test procedures are understood
- correct tests and methods are specified
- test results are interpreted appropriately
- polymer properties are described
- changes in properties are adequately explained.

Assessment method and context

Assessment will occur using appropriate industrial polymers and scenarios and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- using an appropriate, industrial polymers and properties/characteristics relevant to the process/product
- in a situation allowing for the generation of evidence of the ability to recognise, anticipate and respond to problems
- by using a suitable simulation and/or a range of case studies/scenarios
- through a combination of these techniques.

In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment. Assessors need to be aware of any cultural issues that may affect responses to questions.

Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Specific resources for assessment

This section should be read in conjunction with the Range Statement for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Where reference is made to industry codes of practice and/or Australian/international standards, the latest version must be used.

Context

This competency unit includes the use of phase diagrams. It does not include chemical form and structure of polymer molecules beyond a basic knowledge. It may be applied to plastics only, rubber only, thermosetting resins only or all of these.

This competency applies to all work environments and sectors within the plastics, rubber and cabling industry. It requires an understanding of the operation of all relevant equipment and processes but does not necessarily require them to be used personally.

Standard procedures means all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Procedures

All operations are performed in accordance with procedures.

Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Unit Sector(s)

Not applicable.