Australian Government

Department of Education, Employment and Workplace Relations

MSATCM304A Interpret basic binary phase diagrams

Revision Number: 1

MSATCM304A Interpret basic binary phase diagrams

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	This unit covers the knowledge and skills needed to interpret phase diagrams and so predict the microstructures of binary alloys.

Application of the Unit

Application of the unit	This unit applies to the interpretation of cooling phase diagrams as used in metallurgy. The application will primarily be to phase diagrams of metals and alloys showing temperature and composition variables. In a typical scenario, a metallurgical technician will be required to recommend a phase transition process in order to obtain a required microstructure, or to predict a microstructure from a known phase transition process.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Pre-requisite Units		

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Employability Skills Information

Employability Skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the microstructures from an equilibrium cooling phase diagram	1.1. Phase diagram for metal or alloy is obtained from internal or external sources 1.2. Identify number, composition, proportion and structural arrangement of phases in binary alloys. 1.3. Describe structural changes due to varying proportion of alloying elements and temperature. 1.4. Describe the phase changes and final microstructures of binary alloys cooled under equilibrium conditions from the melt or during heat treatment operations.
2. Identify the microstructures from a non equilibrium cooling phase diagram	2.1. Identify number, composition, proportion and structural arrangement of phases in binary alloys. 2.2. Describe structural changes due to varying proportion of alloying elements and temperature. 2.3. Describe the phase changes and final microstructures of binary alloys cooled under equilibrium conditions from the melt or during heat treatment operations.
3. Recognise characteristic microstructures of binary alloys	3.1. .Recognise characteristic structures of dendrites (homogeneous and cored) columnar and equiaxed grains. 3.2. Recognise characteristic structures resulting from eutectic, eutectoid and peritectic reactions. 3.3. Recognise characteristic structures resulting from solid state precipitation.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level, required for this unit.
Required skills:
• produce a basic cooling phase diagram from supplied data • estimate composition from the structure of a phase diagram • predict structure from the composition from a phase diagram
Required knowledge:
Competency includes sufficient knowledge of: • methods of construction of phase diagrams for binary alloys. • the phase changes that occur in binary alloy systems as recorded by the appropriate phase diagrams. • the equilibrium and non equilibrium cooling of binary alloys and the resulting microstructures in cast and heat treated material.

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Evidence Guide

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 the Training Package.

Overview of assessment	The person will be able to interpret binary phase diagrams. Assessment may be by workplace project, case study or suitable alternative.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the ability to: • recognise and use correct scientific terminology in regards to phase diagrams • source phase diagrams and other reference material from internal or external sources • use phase diagrams to interpret intermediate and final phase structures of binary alloys
Relationship to other units	This unit may be assessed concurrently with other relevant units.
Assessment method and context	Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the elements, performance criteria, skills and knowledge. A holistic approach should be taken to the assessment. Assessors should gather sufficient, fair, valid, reliable, authentic and current evidence from a range of sources. Sources of evidence may include direct observation, reports from supervisors, peers and colleagues, project work, samples, organisation records and questioning. Assessment should not require language, literacy or numeracy skills beyond those required for the unit. The assessee will have access to all techniques, procedures, information, resources and aids which would normally be available in the workplace. The method of assessment should be discussed and agreed with the assessee prior to the commencement of assessment.
Resource implications	This section should be read in conjunction with the range of variables for this unit of competency.

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EVIDENCE GUIDE	
	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.

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. Bold italicised wording, if used in the performance criteria, is detailed below. 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) may also be included.	
Codes of practice/standards	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
Scientific techniques and principles of cooling phase diagrams relate to	• Equilibrium phase diagrams • Non-equilibrium phase diagrams • Effect of temperature and alloying elements on structural changes • Structures of homogenous and cored dendrites • Structures of columnar and equiaxed grains • Eutectic, eutectoid and peritectic reactions

Unit Sector(s)

Unit Sector	Metallurgy

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Competency field

Competency Field	

Co-requisite units

Co-requisite Units		

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