



Satuan Acara Pengajaran

ENMT800005 - Karakterisasi Material + Lab

Pengajar

Nofrijon Bin Imam Sofyan Ph.D

Tujuan Perkuliahan

Setelah mengambil mata kuliah ini diharapkan mahasiswa mampu memahami prinsip dasar karakterisasi bahan untuk tujuan mengetahui sifat mekanik maupun sifat mikro bahan menggunakan pengujian yang merusak (DT) maupun pengujian tidak merusak (NDT) dan penggunaan alat ini baik sendiri maupun bersamaan untuk kemudian mampu mengapilikasikannya untuk tujuan pemecahan masalah yang berhubungan dengan bahan

Minggu 1

Materi	Class introduction - About the class - Rules - Grading - Brainstorming
---------------	--

Media	LCD Projector
--------------	---------------

Referensi	<ol style="list-style-type: none">1. C.R. Brundle, C.A. Evans, Jr., S. Wilson, Encyclopedia of Materials Characterization, Butterworth-Heinemann, Boston, 1992.2. B.D Cullity, Elements of X-ray Diffraction, Addison-Wesley Publishing Co. Inc., Massachusetts, 1978.3. ASM Metals Handbook, Vol 09 - Metallography and Microstructures4. ASM Metals Handbook, Vol 10 - Materials Characterization5. S. Amelinckx, D. van Dyck, J. van Landuyt, and G. van Tendeloo: Electron Microscopy Principles and Fundamentals, VCH Verlagsgesellschaft mbH, Weinheim (1997)6. F.A. Settle: Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall PTR (1997)
------------------	--

Aktivitas Lecture
 Problem solving

Minggu 2

Materi Basic in Materials Characterization: Crystal Structure
 - Crystal system
 - Plane and direction
 - Atomic position
 - Exercise

Media LCD Projector

Referensi B.D. Cullity: Elements of X-ray Diffraction, 2nd ed., Addison-Wesley Publishing Company Inc., Reading, Massachusetts, 1978
 C. Hammond: The Basics of Crystallography and Diffraction, 3rd ed., Oxford University Press Inc., New York, 2009.
 R.J.D. Tilley: Crystals and Crystal Structures, John Wiley & Sons Ltd., Chichester, West Sussex, England, 2006
 W.D. Callister, Jr.. Fundamentals of Materials Science and Engineering, John Wiley & Sons, Inc., New York, 2001

Aktivitas Lecture
 Exercise

Minggu 3

Materi Basic in Materials Characterization: Crystal Symmetry
 - Bravais Lattice
 - Point Group
 - Space Group
 - Notation and Symbol
 - Exercise

Media LCD Projector

Referensi B.D. Cullity: Elements of X-ray Diffraction, 2nd ed., Addison-Wesley Publishing Company Inc., Reading, Massachusetts, 1978
 C. Hammond: The Basics of Crystallography and Diffraction, 3rd ed., Oxford University Press Inc., New York, 2009.
 R.J.D. Tilley: Crystals and Crystal Structures, John Wiley & Sons Ltd., Chichester, West Sussex, England, 2006
 W.D. Callister, Jr.. Fundamentals of Materials Science and Engineering, John Wiley & Sons, Inc., New York, 2001

Aktivitas Lecture
 Lab preparation

Minggu 4

Materi Basic in Materials Characterization: Stereographic Projection
 - Construction
 - Wulff Net
 - Zone Equation
 - Exercise

Media LCD Projector

Referensi B.D. Cullity: Elements of X-ray Diffraction, 2nd ed., Addison-Wesley
 Publishing Company Inc., Reading, Massachusetts, 1978
 C. Hammond: The Basics of Crystallography and Diffraction, 3rd ed., Oxford
 University Press Inc., New York, 2009.
 R.J.D. Tilley: Crystals and Crystal Structures, John Wiley & Sons Ltd.,
 Chichester, West Sussex, England, 2006
 W.D. Callister, Jr.. Fundamentals of Materials Science and Engineering, John
 Wiley & Sons, Inc., New York, 2001

Aktivitas Lecture
 Exercise

Minggu 5

Materi Fundamental Concept in Materials Characterization
 - Fundamental of X-Ray Diffraction
 - Diffraction by a Crystal
 - Bragg's Law
 - Structural Factor
 - Exercise

Media LCD Projector

Referensi C. Hammond: The Basics of Crystallography and Diffraction, 3rd Ed., Oxford
 University Press, 2009.
 B. D. Cullity: Elements of X-ray Diffraction, Addison-Wesley Publishing
 Company, Inc., 1978.
 R.J. D. Tilley: Crystals and Crystal Structures, John Wiley & Sons Ltd.,
 2006

Aktivitas Lecture
 Exercise

Minggu 6

Materi Lab-1
Preparation of Al - Zn systems:
No Zn Al
1 85.0 15.0
2 77.7 22.3
3 55.0 45.0
4 20.0 80.0

Media Lab coat
Safety Google
Lab equipment

Referensi [1] Thaddeus B. Massalski (Ed), et al., Binary Alloy Phase Diagrams, 2nd Ed. Vol. 1 (1990) 239 ? 241.
[2] S Müller, L-W Wang and Alex Zunger, Modelling Simul. Mater. Sci. Eng. 10 (2002) 131 ? 145.
[3] B. D. Cullity, Elements of X-Ray Diffraction, 2nd Ed., Addison-Wesley Publishing Co., Inc., Massachusetts (1978) 120, 350 ? 368.
[4] P. Villars and L. D. Carvert, Pearson?s Handbook of Crystallographic Data for Intermetallic Phase, Metals Park OH: ASM (1985).
[5] Theo Hahn (Ed.), International Tables for Crystallography, Vol. A Space-Group Symetry, IUCr, Kluwer Academic Publisher, (1995).

Aktivitas Laboratorium activity: casting

Minggu 7

Materi Lab-2
X-Ray Diffraction:
As-cast
As-quench
Quench-anneal

Media Laboratory equipment
XRD

- Referensi**
- [1] Thaddeus B. Massalski (Ed), et al., Binary Alloy Phase Diagrams, 2nd Ed. Vol. 1 (1990) 239 ? 241.
 - [2] S Müller, L-W Wang and Alex Zunger, Modelling Simul. Mater. Sci. Eng. 10 (2002) 131 ? 145.
 - [3] B. D. Cullity, Elements of X-Ray Diffraction, 2nd Ed., Addison-Wesley Publishing Co., Inc., Massachusetts (1978) 120, 350 ? 368.
 - [4] P. Villars and L. D. Carvert, Pearson's Handbook of Crystallographic Data for Intermetallic Phase, Metals Park OH: ASM (1985).
 - [5] Theo Hahn (Ed.), International Tables for Crystallography, Vol. A Space-Group Symetry, IUCr, Kluwer Academic Publisher, (1995).

Aktivitas Specimen Diffractogram from Lab-1

Minggu 8

Materi Midterm

Media

Referensi

Aktivitas

Minggu 9

Materi

- Metallography
- Specimen preparation
- Sectioning
- Mounting
- Grinding
- Polishing
- Etching

Media LCD Projector

- Referensi**
- 1. Kay Geels: Metallographic and Materialographic Specimen Preparation, Light Microscopy, Image Analysis and Hardness Testing, ASTM International, (2007)
 - 2. Günter Petzow: Metallographic etching: techniques for metallography, ceramography, plastography, ASM International, Materials Park, OH, (1999)

Aktivitas Lecture

Minggu 10

Materi Lab-3
SEM/EDX

Media Lab equipment
Prepared Specimen

Referensi 1. S. Amelinckx, et al.: Electron Microscopy, Principles and Fundamentals, VCH Verlagsgesellschaft mbH, Weinheim, 1997.
2. C Richard Brundle, Charles A. Evans, Jr., and Shaun Wihon: Encyclopedia of Materials Characterization, Butterworth-Heinemann, MA, 1992.
3. S. J. B. Reed: Electron Microprobe Analysis and scanning electron Microscopy in Geology, Cambridge University Press, Cambridge, 2005.

Aktivitas Microstructure and composition characterization

Minggu 11

Materi Project Assignment:
Microstructure and Lattice Parameters Change in Al - Zn Alloys

Media Computer/Laptop

Referensi [1] Thaddesius B. Massalski (Ed), et al., Binary Alloy Phase Diagrams, 2nd Ed. Vol. 1 (1990) 239 - 241.
[2] S Müller, L-W Wang and Alex Zunger, Modelling Simul. Mater. Sci. Eng. 10 (2002) 131 - 145.
[3] B. D. Cullity, Elements of X-Ray Diffraction, 2nd Ed., Addison-Wesley Publishing Co., Inc., Massachusetts (1978) 120, 350 ? 368.
[4] P. Villars and L. D. Carvert, Pearson?s Handbook of Crystallographic Data for Intermetallic Phase, Metals Park OH: ASM (1985).
[5] Theo Hahn (Ed.), International Tables for Crystallography, Vol. A Space-Group Symetry, IUCr, Kluwer Academic Publisher, (1995).

Aktivitas Journal Writing and Preparation
