

KTH Royal Institute of Technology
School of Industrial Engineering and Management
Department of Materials Science and Engineering
Unit of Structure

POWDER METALLURGY (MH2100) 6 credits

Fall 2018

Teachers: Greta Lindwall (gretal@kth.se), Chris Hulme-Smith (chrihs@kth.se) and Armin Salmasi (salmasi@kth.se)

Examiner: Greta Lindwall

Purpose

The aim of the course is to provide the students with knowledge about the field of powder metallurgy and to teach the students generic principles associated with creating powders and fabricating engineering shapes from those powders.

Intended learning outcomes

At the end of the course, the participants should demonstrate the ability to:

- Summarize the different steps taking during processing of powder-based materials in general and for materials/processes of special interest for Swedish PM industry in particular.
- Describe different methods for characterization and fabrication of powder.
- Describe different methods for compaction, pressing and shaping of powder.
- Describe different methods for freeform fabrication in general and powder-based additive manufacturing in particular.
- Explain the physical background to sintering in general and to sintering of cemented carbides and sintered steels in particular.

Lectures and exercise sessions

Seven lectures (each 2x45min) will be given. During the exercise sessions problems associated with powder and powder materials process will be solved. Some of the exercise occasions will be used as peer-teaching sessions and for discussing scientific research publications and/or industry xxxx

Laboratory work

The course includes two mandatory labs: powder characterization (3/12) and sintered steels (8/12).

Eligibility

MH2038 Micro and Nano Structures in Materials.

Literature

- Powder Metallurgy & Particulate Materials Processing (2005) by B. German (ISBN: 0-97620571-8)
- Additive Manufacturing Technologies by I. Gibson et al. (ISBN: 978-1-4939-2113-3 (eBook))
- Handouts, collection of exercises

Schedule

Activity	Date, time, location	Content	Literature	Teacher
Lecture 1	29/10, 15-17, L41	Introduction, Powder fabrication/characterization	German: Ch. 1-2 BU: Ch. 1-2	Greta
Exercise 1	1/11, 10-12, L44	Powder fabrication	Handouts	Greta, Armin
Lecture 2	5/11, 15-17, L43	Powder fabrication/characterization	German: Ch. 3-4	Greta
Exercise 2	8/11, 10-12, L44	Powder characterization	Handouts	Greta, Armin
Lecture 3	12/11, 15-17, L43	Making shapes from powder: Shaping, compaction, full-density processes	German: Ch. 5-7, 10	Greta
Exercise 3	15/11, 10-12, L44	**in progress**	Handouts	Greta, Armin
Lecture 4	19/11, 15-17, L43	Making shapes from powder: AM techniques, design for AM	Gibson: Ch. 1, 3 (3.2, 3.4, 3.7), 5, 8, 10	Greta
Lecture 5/Exercise 4	22/11, 10-12, M24	Making shapes from powder: AM powder/materials	Gibson: Ch. 1, 3 (3.2, 3.4, 3.7), 5, 8, 10 Handouts	Greta
Lecture 6	26/11, 15-17, L44	Cemented carbides	BU: Ch. 6	José Garcia, Sandvik Coromant
Exercise 5	29/11, 10-12, L44	**in progress**	Handouts	
Lab 1	3/12, 4 h, Swerim in Kista	Powder characterization	Handouts	Pelle Melin, Swerim
Exercise 6	6/12, 10-12, B21	Summary of lab results		Greta, Armin
Lab 2	7/12, 9-13, Blå	Sintered steels	German: Ch. 8-10, 12	Marja Haglund, Höganäs
Lecture 7	10/12, 15-17, L43	Finishing operations Recap – sintering of steels and cemented carbides	German: Ch. 5-10, 12 Gibson: Ch. 14	Greta
Exercise 7	13/12, 10-12, D36	Questions and discussions	Handouts	Greta, Armin
Exam	14/1, 14-18, B22/B23			