科目ナンバリング	U-LAS70 10002 SE50						
授業科目名 <英訳>	ILAS Seminar-E2 :Nanostructured Materials（ナノ組織材料） ILAS Seminar-E2 :Nanostructured Materials			担当者所属 職名・氏名	工学研究科　准教授　GAO，Si		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール（対面授業科目）
開講年度・開講期	2026・前期	受講定員 (1回生定員)	15 (15) 人	配当学年	主として1回生	対象学生	全学向
曜時限	火5	教室	工学部物理系校舎 南棟 8F 822 (本部構内)			使用言語	英語
キーワード	Materials Science / microstructures of materials / properties of materials						

[授業の概要・目的]

The physical properties of materials, such as strength, ductility, toughness and corrosion resistance largely depend on their microstructures - the very small scale (generally smaller than 0.1 millimeter) structures of the material that can be only observed by microscopes. By tuning the microstructures the physical properties of the materials can be greatly modified without changing their chemical compositions. Nanostructured materials refer to the materials having microstructures of which the characteristic length scale is very small, generally in the order of 1 to 1000 nanometers (1 nanometer is equal to 10^-9 meter). Because of the extremely fine microstructures, the nanostructured materials often exhibit superior physical properties which cannot be obtained from the conventional materials having coarse microstructures. The purpose of this course is to introduce the frontier research of the nanostructured materials with focusing on the microstructures and mechanical properties of nanostructured metals and metallic alloys. For that purpose, the background knowledge of material science and engineering and physical metallurgy will be firstly introduced in the seminar. Examples of the nanostructured materials having excellent properties and the related physical mechanisms will then be introduced and discussed. Laboratory tours are offered to the students to learn the cutting-edge techniques for fabricating and characterizing the nanostructured materials.

[到達目標]

By taking this course, students will learn why the materials researches are going into the length scale of nanometer in recent decades. In addition, they will have a brief understanding on the frontier researches of processing, properties and microstructures of the nanostructured metals and alloys.

[授業計画と内容]

1. Introduction to materials and materials science
2. Atomic structure and interatomic bonding
3. Structure of crystalline solids
4. Imperfections in solids
5. Microstructures of materials and concept of nanomaterials
6. Laboratory tour* (Techniques for evaluating the mechanical properties and microstructures observation)
7. Metallic materials having nanostructures
8-11. Microstructures and mechanical properties of nanostructured metallic materials
12. Laboratory tour* (Techniques for creating nanostructured metallic materials)
13-14. Advanced characterization techniques
15.Feedback

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* Two laboratory tours in the 6th and 12th week will be held in the laboratory for structure and property of materials in the Department of Materials Science and Engineering at Yoshida campus.

[履修要件]

特になし

[成績評価の方法・観点]

Attendance and active participation [60%]
Final report [40%]

[教科書]

使用しない

[授業外学修（予習・復習）等]

Students are required to read assigned materials (distributed by the teacher) before and after the class for preparation and review. The necessary time for those would be around 2 hours for each class.

[その他（オフィスアワー等）]

Take out accident insurance.（Students Pursuing Education and Research (Gakkensai)）.

[主要授業科目（学部・学科名）]