

# Syllabus

## Energy materials chemistry

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### 1. Course Description

The main objectives of this course are

(i) to know the basic concept regarding synthesis of metal-oxide powder,

This course addresses principles of powder preparation, including sol-gel method, coprecipitation method, and the basic chemistry underlying these principles.

(ii) to understand the technical methods for characterization of the materials,

This course will comprehensively instruct students in the application of contemporary techniques in powder diffractometry (X-ray or neutron) from data collection to data assessment and interpretation. Students will learn how to choose the correct method for data collection, to index a powder of an unknown substance, solve the structure via Rietveld method. Additionally they will learn how to use EM(electron diffraction) in determining the crystal structure of materials.

### 2. Teaching Methods

This lecture will be conducted with three main themes as follows;

1. Principles for material synthesis
2. Characterizing methods for the physical properties of compounds.
3. Crystal structure determination based on powder X-ray diffraction

Lectures-3 hours a week

### 3. Evaluation

Exam 50%

Term report & presentation 40%

Attitude 10%

#### 4. TextBooks

The files for lectures will be uploaded at "e-class".

#### 5. Lecture Schedule

Week	Lecture contents	Lesson type	Remark
1	Introduction to powder X-ray diffraction – Basic concepts	Lecture	
2	Introduction to powder X-ray diffraction – Point group & Space group	Lecture	
3	Introduction to powder X-ray diffraction – Point group & Space group	Lecture	
4	Structural analysis – Indexing	Lecture	
5	Structural analysis – Rietveld refinement	Lecture	
6	Structural analysis – Rietveld refinement	Lecture	
7	Practice	Lecture	
8	Mid-term exam	Exam	
9	Introduction to synthesis of metal oxide powder	Lecture	
10	Solubility diagram	Lecture	
11	Co-precipitation method	Lecture	
12	Sol-gel method	Lecture	
13	preparation of nano materials	Lecture	
14	preparation of nano materials	Lecture	
15	characterization of powder	Lecture	
16	Final exam	Exam	

6. Others

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