**Subject: Phase Transformation of Materials**

Subject number: 445.302

Professor: Nong-Moon Hwang (880-8922)

Professor Room: 33-314

Lecture number: 003

Lecture: Tue, Thu. 10:30~11:45 at 30-516

Target: 3rd, 4th grade

E-mail: nmhwang@snu.ac.kr

Prerequisite Subjects: Introduction to Material Engineering, Thermodynamics of Materials

Lecture Assistant: Sung-Soo Lee, Soon-Young Park (880-9152)

Lecture Homepage: <http://eng.snu.ac.kr/~tfmlab>

Office hour: by an appointment

* Goal of the lecture

The goal of this lecture is to understand the fundamental concept of phase transformation of materials and formation of microstructure. Furthermore, we will go through theory of nucleation, growth and kinetics.

* Outline of the lecture

Based on fundamental understanding of thermodynamics of materials and phase diagram, I will focus in detail on kinetics of reaction in materials for 3rd-4th grade students majoring material engineering. In addition, we will study about theory of reaction and solidification which occur in the phase or on the interface of crystals, phase transformation phenomena with or without diffusion.

* Application of the lecture

The property of material is determined by crystal phases and microstructure. Because this lecture will cover transformation of metal, structure of interfaces of crystal, nucleation, growth, and kinetics in thermodynamical way, you can fully appreciate the basic notions of phase transformation and formation of microstructure in real process. Therefore, you can understand the practical process and material property needed for it.

* Reference books

Phase Transformations in Metals and Alloys, 2nd ed., D. A. Porter and K. E. Easterling, Chapman&Hall

The Theory of Transformations in Metals and Alloys, 2nd ed., J. W. Christian, Pergamon Press

* Evaluation

Midterm (30%) + Final exam (30%) + Attendance, assignment, and participation in class (15%) + Problem Solving (25%)

Grading: A(20%), B(30%), below C(50%) or A(30%), B(30%), below C(40%)

For students who had taken the same lecture, their grade is accepted 90%.

* Achievement of the lecture
* Based on the basic theory of Physics such as Thermodynamics, Crystallographic, you can understand the kinetic phenomena of materials such as nucleation, growth and diffusion and by expressing them in mathematics, ultimately apprehend the phase transformation of various materials.
* You can apply important phase transformation phenomenon such as nucleation, growth, diffusion, and effect of interfaces into various systems.
* You can learn the basis for designing an experiment plan in purpose of obtaining certain material by considering process variables which can affect phase transformation.
* You can be taught essential elements which enable you to handle the practical business by learning diverse conditions at many systems and control.
* You can develop a process for synthesis of innovative materials which can have special electrical/mechanical properties.