-TIGP course on Advanced nanotechnology A

Course agenda (I)

From Feb. 24th to April 13th by Dr. Chun-Wei Pao

How and why do nanomaterials form?

- **Feb. 24th** : Introduction and review of thermodynamics
- **Mar 2nd** : Capillary
- **Mar 9th** : Diffusion: Elementary Concepts
- **Mar 16th** : Diffusion under External Fields
- **Mar 23rd** : Diffusion and Self-Assembly
- **Mar 30th** : Phase Separation
- **Apr. 6th** : Nucleation and Growth
- **Apr. 13th** : Special Topics in Nucleation and Growth – Growth Kinetics of 2D materials

References

- Robert T. DeHoff, "Thermodynamics in Materials Science", *McGraw-Hill*.
- D.A. Porter and K.E. Easterling, "Phase Transformations in Metals and Alloys", Taylor & Francis.

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Course agenda (II)

From April 20th to June 6th by Dr. Wei-Li Lee

Carbon nanostructure

April 20th - Lecture I : 0D system, carbon-based buckyballs (fullerene)

April 27th - Lecture II : 2D system, emerging material : graphene

May 4th - Lecture III : 1D system, carbon nanotube

Nanomagnetism and Spintronics

May 11th - Lecture IV: Introduction to magnetism

May 18th - Lecture V: Magnetic Nanostructure

May 25th - Lecture VI: Spintronics (I)

June 1st - Lecture VII: Spintronics (II)

June 8th - Lecture VIII : Other novel materials and their physical property

June 15th : Study group oral presentation lunch boxes provided

June 22nd - Final exam

Score : 50% final exam + 30 % oral presentation + 20 % class attendance

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Guideline

Lecture - Wednesday 9:10am - 12pm

20 minutes break from 10:20am to 10:40 pm

Study group – 2-3 people a group

each person, 15 minutes oral presentation, 5 for questions

topics :

1.Formation mechanism of 2D materials and nanomaterials
2.Physical property of transition metal dichalcogenide
3. Physical property of silicone and other 2D materials beyond graphene
4. Realistic application of graphene-based device
5. Recent development of magnetic data storage technology
6. Novel properties of nano-devices, nanostructures or materials.
7. Emergent phenomena at material interfaces
8. Novel materials and their properties that are not covered in this course.
9. Advanced characterization technique and its applications that are not covered in this course.

Oral presentation guideline (30% of your final score !)
(15 minutes presentation+ 5 minutes question

- Introduction and review
- What is the main difference to the previous known system ?
- What is the current interests and issues ?
- What is the importance to current Science and technology ?

Reference Books:

Introduction to Nanotechnology by Poole and Owens

Science of Fullerenes and carbon nanotubes by Dresselhaus and Eklund

Solid state Physics by Ashcroft/ Mermin

Modern Magnetic Materials by O`Handley