MS2083 – Laboratory on Structure-Property Relationship

Course Code	MS2083						
Course Title	Laboratory on Structure-Property Relationship						
Pre-requisites	MS2013	Introduction to Polymer Science					
Pre-requisite for	MS3015	Industrial Design					
No of AUs	1						
Contact Hours	LECTURES (pre-recorded)	2	LABORATORY	13 hrs			

Course Aims

Objectives of this module:

To understand the influence of molecular weight on thermal and mechanical properties of polymers.

Specifically:

1. To characterize the hydrodynamic size, virial coefficient and estimate the molecular weight using dynamic light scattering (DLS) technique.
2. To understand the concepts behind light scattering technique and Zimm plot.
3. To compound different molecular weight polystyrene (PS) and prepare tensile specimens.
4. To perform differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and tensile testing on specimens of different molecular weight.

To explain the differences observed in the data between the two grades of PS.

What are the underlying theories/concepts?

1. Brownian motion, random walk analysis, polymer solutions (good, poor, theta conditions, Flory-Huggins theory, and UCST/LCST conditions)
2. Characterization of molecular weights and importance
3. Importance of structural features of polymers and their influence on properties

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. Obtain a deeper understanding of some of the concepts that are taught during the course work by using the state-of-the-art scientific equipment and getting hands-on exposure.
2. Understand the laboratory and safe working protocols.
3. Improve skills required for scientific problem solving by establishing the problem, formulating the hypothesis, recording the observations, and interpreting/analyzing the experimental data in a comprehensive manner.
4. Experience team learning and responsibility to complete tasks.
5. Effectively communicating the data in writing form.

Reading and References

1. Joel R. Fried, Polymer Science and Technology, 3rd Edition, Prentice Hall, 2014.
2. L.H. Sperling, Introduction to Physical Polymer Science, 4th Edition, Wiley, 2005.
3. Robert J. Young, Introduction to Polymers, 3rd Edition, CRC Press, 2011.

Course Policies and Student Responsibilities

(1) General

Students are expected to attend the pre-laboratory lecture briefings, complete the lecture-based assignment, and attend all the experimental trainings.

As this module works on an open laboratory concept, students are expected to take responsibility in planning the experimental work required well in advance and execute.

(2) Absenteeism

This module requires you to contribute to teamwork. Therefore, absence from group discussions and experiment planning is unacceptable without a valid reason/supporting documents. Otherwise, this will affect your overall course grade. Though lecture briefing is recorded, but the students are expected to be present for the physical briefing.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.