



Universidade Federal de Santa Catarina
Centro Tecnológico
Departamento de Engenharia Química e
Engenharia de Alimentos



Programa de Pós-Graduação em Engenharia Química

PLANO DE ENSINO TRIMESTRE 2020.2 – AULAS REMOTAS

I. IDENTIFICAÇÃO DA DISCIPLINA

Código	Nome da disciplina	Créditos	Período
ENQ510031	Polymeric Nanomaterials Characterization	3	2020.2

II. PROFESSOR MINISTRANTE

Claudia Sayer
Thiago Ouriques Machado

III. TUTOR

N/A

IV. PRESENÇA NAS ATIVIDADES SINCRONAS

Registered by online access.

V. CURSO E PUBLICO-ALVO

Masters/Doctorate in Chemical Engineering

VI. EMENTA

Characterization methods for polymeric nanomaterials including molecular weight measurement, imaging, scattering, and spectroscopic techniques and their physical operating mechanisms. Fundamentals of polymeric nanomaterials. Size exclusion chromatography; electron microscopy (SEM, TEM); scattering and diffraction (DLS, XRD); spectroscopies (EDX, MALDI-ToF, XPS, NMR, IR); scanning probe microscopes (AFM), calorimetric techniques (DSC).

VII. OBJETIVOS

The comprehension of physical operating mechanisms and fundamentals of the most used techniques for the characterization of polymeric nanomaterials. The course aims to develop the discernment of which technique should be used to characterize a given property of polymeric nanomaterials.

VIII. CONTEUDO PROGRAMATICO

Introduction to polymeric nanomaterials.

Fundamentals of polymer chemistry and surface chemistry

Molecular weight measurement techniques: NMR, GPC, DLS and Maldi-TOF

Size measurement techniques: DLS and other scattering analyses

Electron and scanning probe Microscopies: TEM, SEM, and AFM

Chemical analyses: IR, XPS and EDS analyses

Crystalline structure and characterization: XRD and

DSC Thermal properties and calorimetric techniques

IX. METODOLOGIA DE ENSINO / FORMA DE TRABALHO

Synchronous activities

Weekly classes using Google Meeting (links will be made available previously in Moodle). This classes will be composed of short lectures followed either by a discussion and assignments, including questionnaires and tutorials or by seminars of the students related to the topic of the previous lecture. Assignments and tutorials will be corrected during classes.

Asynchronous activities

Students are oriented to dispose of some time for asynchronous activities: Working on assignments to be discussed during classes, solving exercises, and preparing seminars.

X. METODOLOGIA DE AVALIAÇÃO

Seminaries (30%) and several assignments and tutorials (70%) to be solved by small groups or individually during the classes guided by the lecturer (if a student misses one of these classes he will be able hand in until the next class.)

XI. CRONOGRAMA

Lecture 1. Introduction to polymer science. Fundamentals of polymer chemistry.

Lecture 2. Fundamentals of surface chemistry. Introduction to nanomaterials properties.

Lecture 3. Polymer solution thermodynamics. Molecular weight measurement techniques: Osmotic pressure, NMR, GPC, and Maldi-TOF.

Lecture 4 Molecular weight measurement techniques: Fundamentals of light scattering for molecular weight measurements.

Lecture 5. Fundamentals of techniques for size measurements of submicrometric particles and thin-films: DLS and other scattering techniques and diffraction techniques.

Lecture 6. Electron microscopy techniques for imaging: TEM e SEM. Scanning probe microscopy (AFM).

Lecture 7. Fundamentals of spectroscopic techniques: EDS and XPS, IR, NMR applied to polymers

Lecture 8. Crystalline structure of polymers and their characterization by: XRD and DSC.

Lecture 9. Thermal properties of polymers and calorimetric techniques (DSC). Mechanical properties of polymers and polymeric nanomaterials.

XII. BIBLIOGRAFIA

Weblinks posted on Moodle.

Research and review articles posted on Moodle.

Further reading:

Hiemenz, P. C.; Lodge, T. P. (2007). *Polymer Chemistry*. 2nd ed. Boca Raton: CRC Press Taylor and Francis Group. 587.

Cowie, JMG; Arrighi, V. (2007). *Polymers: Chemistry and Physics of Modern Materials*. 3rd ed. Boca Raton: CRC Press Taylor and Francis Group. 499.

Goyal, R. K. (2018). *Nanomaterials and Nanocomposites: Synthesis, Properties, Characterization techniques, and Applications*. Boca Raton: CRC Press Taylor and Francis Group. 332.

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Um Bom Trimestre a todos(as)!!!

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Pós-DOC

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