

Syllabus: Polymer Science and Polymeric Membranes
פולימרים וממברנות פולימריות

Course name: Polymers and polymeric membranes (No. 1-2-0017)

Lecturer: Prof. Roni Kasher

3 lecture hours (3 credits). Grading: final exam

To be given in fall semester

Pre-requisite: Recommended – introductory course in organic chemistry.

Objectives: Offers introduction to the polymer field, including polymer synthesis, polymer properties, and methods for polymer characterization, as well as knowledge of polymers used for preparation of advanced membranes for water treatment and gas separations.

Syllabus: (1) Origin of polymer science and its importance to industry, from monomers to polymers, nomenclature, classification, thermoplastic/thermoset polymers; (2) Step polymerization reactions: polyesters, polyamides-nylon, polyurethane. Kinetics and control of degree of polymerization. Polysiloxanes, polycarbonates; Interface-polymerization; epoxy resins; gel-effect. (3) Chain-polymerization: mechanism, kinetics, and initiation methods of radical polymerization: polystyrene, polypropylene, PVC; anionic-living polymerization, organometallic initiators, polyethylene-oxide. (4) Tacticity of polymers, glass transition temperature (T_g), polymer crystallinity, mechanical properties of polymers, elastomers, viscoelasticity, ring-opening polymerization, co-polymerization. (5) Evaluation of molar mass of polymers, membrane osmometry, light scattering methods; gel permeation chromatography. (6) Polymers as membrane materials: Membrane mediated water purification by cellulose-acetate and polycarbonate; hydrophobic microfiltration membranes by polypropylene, polytetra-fluoroethylene, poly-vinylidene fluoride. (7) Membranes for Aqueous ultrafiltration: polysulfone, polyethersulfone, cellulose-esters, poly-acrylonitrile and polyamide membranes; aromatic-polyamide and polyimide dense membranes in reverse osmosis and nanofiltration.

Bibliography

- 1) Introduction to polymers/R.J. Young, P.A. Lovell, 2nd ed., 1991.
- 2) An introduction to polymer science/H-G Elias, 1997.
- 3) Textbook of polymer science/Fred W. Billmeyer, 1984.