

## Preparation of Polymeric Microcapsules: A Mini Review

V. Abedi, M. R. Moghbeli\*

College of Chemical Engineering, Iran University of Science and Technology, Tehran, Iran

E-mail: mr\_moghbeli@iust.ac.ir

### Abstract

*Microencapsulation is a process in which solid particles or droplets of liquids and gas bubbles are engulfed by a polymeric thin film or by a coat of inorganic materials. The material inside of a film and the film are so-called core and shell membrane, respectively. Many kinds of microcapsules are extensively used to encapsulate the foods, pharmaceuticals, perfumes, pigments, pesticide and insecticide, catalysts, and enzymes. The shell of microcapsules are often made from a variety of natural or synthetic polymers, depending on the kind of core agent, method of manufacture, and application and desired characteristics in microcapsules. Often, the target of applied microcapsule is controlled timed release and sustained release of core material into consumption medium. The aim of this study is to evaluate the kinds of methods used to prepare polymeric microcapsules. These methods are divided into two main categories: chemical methods and physical methods. Chemical methods have most been used to microencapsulate the chemical active agents. Physical methods have been applied to prepare microcapsules containing medicinal and alimentary materials which are directly connected to the life. The important advantages of the physical methods compared to the chemical ones are to minimize using organic solvents and to control processing temperature; hence using supercritical fluid method in between is the best suitable method which can be used in medicinal and food industries.*

**Keywords:** Microcapsule, Release, Interfacial polymerization, In-situ polymerization, Fluidized bed coater, Nuzzle, Atomizer, Supercritical fluid



## Functional Properties of Edible Films from Whey Proteins: A Review

B. Ghanbarzadeh<sup>1\*</sup>, E. Razmi Rad<sup>2</sup>, H. Almasi<sup>1</sup>, Y. Zahedi<sup>3</sup>

1- Department of Food Science and Technology, Faculty of Agriculture, University of Tabriz, Tabriz, Iran

2- Department of Food Science and Technology, Faculty of Agriculture, University of Tehran, Tehran, Iran

3- Department of Food Science and Technology, Faculty of Agriculture, University of Ferdosi, Mashhad, Iran

E-mail: Babakg1359@yahoo.com

### Abstract

*Proteins are major class of edible biodegradable biopolymers. Whey protein is one of the important protein sources. One of the potential uses of this protein is for production of biodegradable films and coatings. edible, biodegradable films and coatings, by acting as barriers to control the transfer of moisture, oxygen, carbon dioxide, lipids, and flavor compounds, can prevent quality deterioration and increase the shelf life of the food products. In addition, edible films or coatings may provide mechanical integrity and improve the handling characteristics of the food. They can be effective carriers of many functional ingredients, such as antimicrobial agents to improve safety and stability of foods, antioxidants to prevent lipid oxidation, and flavorings and pigments to improve quality of foods. in this manuscript, physico chemical properties of these films (including water vapor and oxygen barrier properties, mechanical, thermal and thermomechanical properties) were investigated.*

**Keywords:** Whey protein, Edible film, Mechanical properties, Permeability, Thermal properties

## Investigating Dynamic Behavior of Control Systems Including Time-Delay Smith Predictor

M. Shirvani<sup>1\*</sup>, M. Younesi<sup>2</sup>, M. Esmaeli<sup>1</sup>

1- Department of Chemical Engineering, Iran University of Science and Technology, Tehran, Iran

2- Pars International Development & Engineering Co. (PIDECO), Tehran, Iran

E-mail: Shirvani.m@iust.ac.ir

### Abstract

The problem of Time-Delay or Dead Time (DT) in control systems is an old problem which is of primary importance in process control as well. It is known as one of the main effects in attenuating the performance of control systems. The first proposed solution for this problem was the Smith predictor in 1957. It was based on the idea of removing the time-delay from the characteristic equation of the control loop, which seemed to be very attractive at the first. In this paper the dynamic behavior of the open loop transfer function of control systems with Smith dead-time compensator were investigated. The various cases resulting to limited or non-limited phase behavior were discussed. In this way the stability characteristics of such systems were discussed and revealed that it is possible to make the behavior of the closed loop system to trace the behavior of the minimum phase term available in the open loop transfer function of the system for improving the performance of the control loop.

**Keywords:** Smith predictor, Limited phase dynamic behavior, Non-Limited phase dynamic behavior, Time-delay



## Thermal Degradation Kinetics of PS and PMMA

H. R. Azimi, M. Rezaei\*, M. Jamali, A. Charchi

Institute of Polymeric Materials, Polymer Engineering Faculty, Sahand University of Technology, Tabriz, Iran.

E-mail: rezaei@sut.ac.ir

### Abstract

In this work, the thermal degradation (pyrolysis) kinetic of polymers was studied. Attention was focused on the thermal pyrolysis of polymethylmethacrylate (PMMA) and polystyrene (PS) as two thermoplastic polymers. Thermogravimetric (TG) analysis is a basic method for kinetic analysis calculations. Different analytical methods such as Flynn-Wall-Ozawa, Friedman, Kissinger and Coats-Redfern were used to determine the triplet kinetic parameters. Consequently the best kinetics model for two polymers was proposed and the simulated kinetics curves based on the determined kinetics parameters were compared to the experimental TG curves. Investigation on thermal degradation of polystyrene shows that random chain scission, unzipping and intermolecular transition reactions are the most dominant mechanisms. Thermal degradation of PMMA progresses at different steps in which the most unstable step, initiates with head to head bounds cleavage.

**Keywords:** Pyrolysis, Thermal degradation kinetics, Chain scission, PS, PMMA

## The Study of Effective Parameters on Drop Size in Agitated Vessels

H. Abolghasemi, M. Zaheri\*, M. Ghanadi maragheh, P. Zaheri  
Chemical Engineering Department, Tehran University, Tehran, Iran  
E-mail: hoab@ut.ac.ir

### Abstract

*From the view point of industrial engineering, solvent extraction process because of many of its applications has been interested by a lot of researchers. Solvent extraction process is carried out in various equipments, such as packed column, pulse column, RDC, mixer settler and etc. Generally the study of effective parameters on rate of mass transfer in the extraction processes are very important. One of important effective parameters on mass transfer and separation is drop size and its measurement is very important. Therefore investigation of various parameters on drop size is very important. In this paper the effective operational parameters on drop size such as impeller speed, impeller geometry and its location, hold up, surfactants are investigated in agitated vessels.*

**Keywords:** Drop size, Impeller speed, Impeller geometry, Hold up, Surfactant



## Application of Genetic Algorithm in Optimization of Well Placement in Oil and Gas Reservoirs

M. Aghabeigi<sup>1</sup>, Z. Dastkhan<sup>1</sup>, M. K. Ghassem Alaskari<sup>2\*</sup>  
1- National Iranian South Oil Company, Ahwaz, Iran  
2- Petroleum University of Technology, Ahwaz, Iran  
E-mail: aghabeigi60@yahoo.com

### Abstract

*Location, distance, placement, and number of wells are important factors in ultimate recovery from an oil or gas reservoir during a specific time interval. Well placement for new wells depends on numerous complex variables. Some of such variables are functions of time and hydrocarbon production. In addition, they are associated with large uncertainties and cannot be expressed by mathematical relations.*

*Among all tools, numerical models can consider all interactions and dependencies of variables of the problem, therefore the best approach for calculation of well placement is numerical reservoir simulators. Although full-scale numerical simulator is the most accurate tool, but direct use of simulator is practically infeasible because the number of required simulation runs is very large. As an alternative, an optimization tool is required to be combined with numerical simulator.*

*In this work, Genetic Algorithm (GA) has been used and investigated for optimization of well placement. A software was written for this purpose and Genetic Algorithm was embedded in it. The software can generate input model files for Eclipse reservoir simulator. We found that, if Genetic Algorithm is tuned carefully for desired problem, it will significantly reduce the number of required simulation runs.*

**Keywords:** Optimization of well placement, Genetic algorithm (GA), Numerical reservoir simulation

# Technological Assessment of Pipeline Transportation of Heavy Crude Oil and Ongoing Challenges

N. Teymourei Khanesary

Department of Petroleum Engineering, Petroleum University of Technology, Ahwaz, Iran

E-mail: Teimouri@Caahwaz.put.ac.ir

## Abstract

*The satisfaction of increasing future energy demands necessitates not only the production of heavy oil from reservoirs, but also requires the use and development of reliable and promising methods of pipeline transportation of heavy crude oil. This article examines various methods of crude oil transportation by pipeline (heating, dilution, oil- in- water emulsion, upgrading and core annular flow), describing their potentiality from both technical and economical views. This paper focuses on the technical solution and possible improvement on them underlying ongoing technological challenges in this regard. This paper also overviews the pipeline transportation of heavy crude oil as a need for Middle-Eastern oil-producing countries including the Islamic Republic of Iran on its routes towards progress, specifically in the future situation.*

**Keywords:** Heavy crude oil, Viscosity, Specific gravity, Asphaltenes, Dilution, Upgrading, Emulsion, Core annual flow