

Modeling of gelatin grafted PMMA polymerization
Deepak Sharma¹, Manojkumar Ramteke^{*2}

¹Department of Paper Technology, IIT Roorkee, India
Email: deepakjangr@gmail.com

²Department of Polymer and Process Engineering, IIT Roorkee, India

*Corresponding Author Email: manojfpt@iitr.ernet.in,
ramtekemanoj@gmail.com

Abstract:

Production of polymers in the emulsion reactor is advantageous to that of bulk reactor specifically for better control and yield. The free-radical polymerizations are often associated with the gel effect and usually these are polymerized in an emulsion reactor. These reactors are used for both homo- as well as co-polymerizations. Usually, the copolymers are used for augmenting the properties. One of such copolymer is gelatin grafted PMMA which is used in biomedical, electronics, architectural and automobile applications. The present study focuses on modelling of gelatin grafted poly-methyl-methacrylate (PMMA) polymerization in emulsion reactor.

A kinetic model is developed for polymerization comprising twenty eight simultaneous reactions. Modelling this complex reaction scheme leads to thirteen differential equations of stiff nature with initial value type. These model equations are further solved using GEARS algorithm. Thus, the state of the system can be obtained at any given time and experimental conditions. These simulation results are used along with the available experimental data to tune the kinetic parameters used in the model. The tuned model further applied on other set of experimental conditions to show a reasonably good agreement with corresponding set of experimental data points.

The tuned model will be further used for multi-objective design optimization using evolutionary algorithms. The objectives of the study are to maximize the grafting and minimizing the batch time.

Keywords: *Grafting, Gelatin-g-PMMA, Radical polymerization, GEARS Algorithm.*