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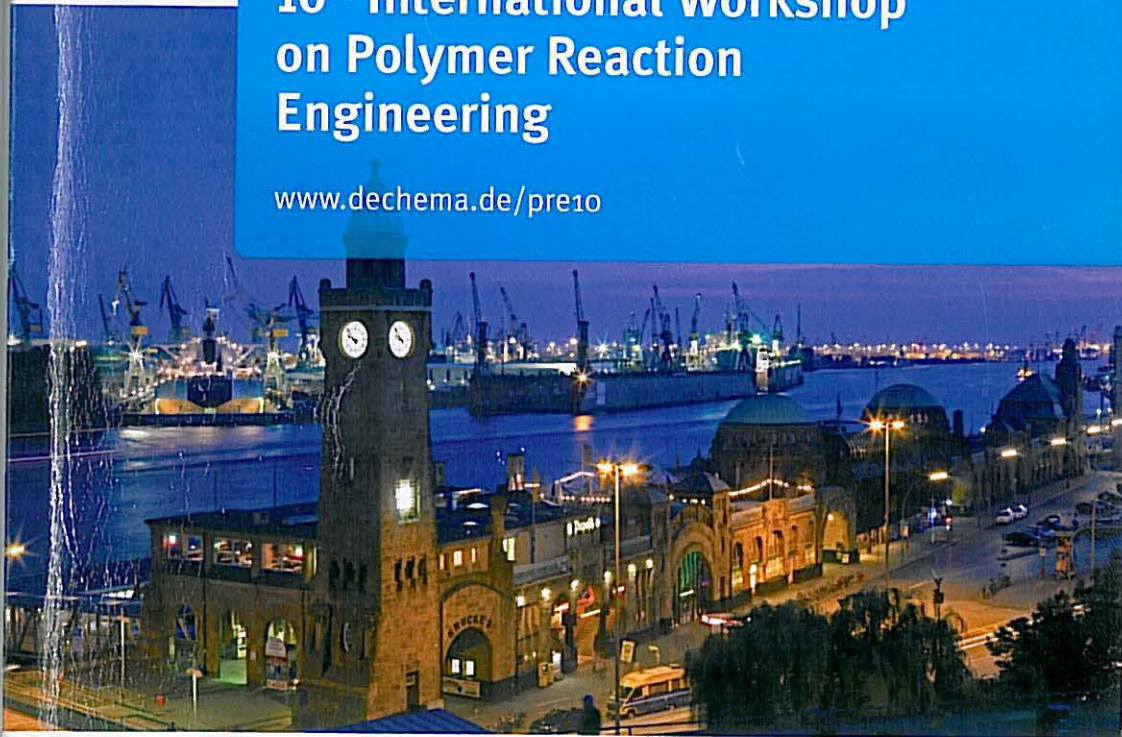
Gesellschaft für Chemische Technik  
und Biotechnologie e.V.

**BOOK OF ABSTRACTS**

October 10–13, 2010  
University of Hamburg / Germany

**10<sup>th</sup> International Workshop  
on Polymer Reaction  
Engineering**

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## Suspension Copolymerization of Styrene/Divinylbenzene with Gel Formation: Kinetic Modelling using *In-Line* FTIR-ATR Monitoring and SEC-MALLS Product Characterization

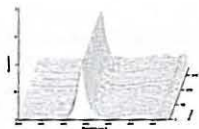
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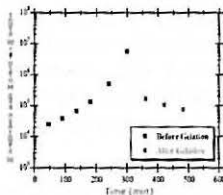
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Experimental and theoretical studies concerning the suspension copolymerization of styrene with divinylbenzene are reported. Experiments are carried out in a batch stirred reactor, at 1.2 dm<sup>3</sup> scale, and extended beyond gelation in order to synthesize macroporous copolymer networks with applications for many separation processes. Experiments are *In-line* monitored using a FTIR-ATR immersion probe to try obtain real time information concerning the building process of such materials. Polymer samples collected before and after gelation are *Off-line* characterized using a SEC/RI/MALLS system allowing the measurement of monomer conversion, average molecular weights, MWD and also the z-average radius of gyration. Monomer conversion is also estimated by gravimetry and the weight fraction of insoluble material (gel) is measured for samples with different reaction times. The swelling ratio of the macroporous styrene/divinylbenzene networks thus produced is measured. The experimental program includes the study of the influence of key polymerization parameters in the dynamics of gelation and performance of the resulting networks: initial mole fraction of crosslinker in the global monomer mixture, initial ratio monomer/initiator (AIBN) and temperature of operation (in the range 60 to 80 °C). Additionally, different initial proportions between monomers and inert diluent are also considered in order to investigate the influence of this parameter in the formation of macroporous structures in the network. Variable *n*-Heptane/Toluene mixtures are used as inert diluent.

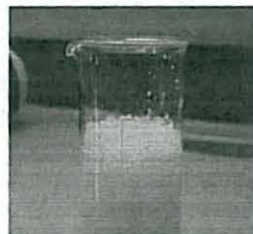
These experimental observations are complemented with theoretical studies using a general kinetic approach<sup>[1,2]</sup> allowing the prediction of MWD and z-average radius of gyration before and also after gelation. Comparison of the experimental measurements with these predictions is used to develop modelling tools useful for the design of operating conditions allowing the improvement of the performance of the final products.



*In-line* FTIR-ATR Monitoring



SEC/RI/MALLS Characterization



STY/DVB gel beads

### References

- [1] MRPFN Costa, RCS Dias, Chemical Engineering Science, 60, 423, 2005.
- [2] MRPFN Costa, RCS Dias, Polymer, 48, 1785, 2007.