DECHEMA
Gesellschaft für Chemische Technik
und Biotechnologie e.V.

PROGRAMME / BOOK OF ABSTRACTS

May 21– 24, 2013
University of Hamburg / Germany

11th International Workshop on Polymer Reaction Engineering

www.dechema.de/pre2013

IN COOPERATION WITH

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

POSTER

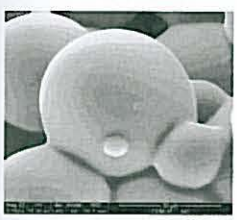
Kinetic Studies on RAFT Inverse-Suspension Smart Hydrogels Formation using a Tetra Detector Array

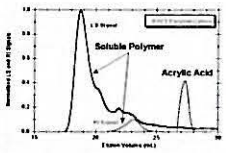
Miguel Gonçalves[1]; Virgínia Pinto[1]; Rolando Dias[1]; Mário Rui Costa[2]; Júlio Hernández-Ortiz[2]

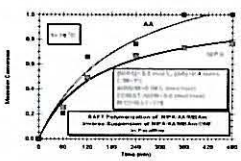
[1]LSRE-Instituto Politécnico de Bragança, Bragança, Portugal

[2]LSRE-Faculdade de Engenharia da Universidade do Porto, Portugal

Temperature/pH stimuli-responsive hydrogel particles were synthesized using inverse-suspension polymerization in batch stirred reactor. Different water soluble co-monomers were present in the initial mixture (namely N-isopropylacrylamide and acrylic acid) as well as crosslinkers with different functionalities (bi-, tri- and tetrafunctional) so that their effect on the network crosslinking density could be seen. Different operating conditions such as polymerization temperature (in the range 20 to 70 °C), monomers dilution, neutralization and the initial ratios of co-monomers and monomers/crosslinker were also tried. Classical free-radical polymerization (FRP) and RAFT polymerization (e.g. using 4-cyano-4-phenylcarbonothioylthio-pentanoic acid) were compared in order to put into evidence the impact of the polymerization mechanism on the hydrogel molecular architecture. Sampling at different polymerization times allowed the study of the kinetics of gel formation through the analysis by SEC of the soluble phase. RI, LALLS, Intrinsic Viscosity and UV signals were simultaneously measured using a tetra-detector array, thus yielding absolute molecular weight, branching factors, hydrodynamic radius and radius of gyration. The performance of hydrogel beads was assessed through drug delivery tests triggered by changes in the environmental temperature/pH. Aiming at the development of tools hopefully useful for the design of such advanced materials, a general kinetic approach (*Chem. Eng. Sci. 2005, 60, 423*) was used to carry out modeling studies including consideration of finite loop formation reactions.







Acknowledgements: Financial support is acknowledged to FCT/European Community through FEDER (project PTDC/EQUEQU/098150/2008) and to the Marie Curie Initial Training Network "Nanopoly" (Project: ITN-GA-2009-238700).