



DECHEMA

Gesellschaft für Chemische Technik
und Biotechnologie e.V.

PROGRAMME / BOOK OF ABSTRACTS / LIST OF PARTICIPANTS

17 – 20 May 2016

University of Hamburg / Germany

12th International Workshop on Polymer Reaction Engineering

www.dechema.de/pre2016

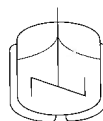
Universität Hamburg

IN COOPERATION WITH



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG



POSTER PROGRAMME

Page

HYDROGELS

- P 62 **Comparison between composites biomaterial system prepared with poly(lactic acid) and Poly(caprolactone) as tissue engineering porous scaffolds by solvent-casting/particulate-leaching** 153
M. Carranza-Oropeza¹; V. Isume¹; P. Monnerat¹; R. Giudici¹; ¹ Sao Paulo University, Sao Paulo/BR
- P 63 **Assessment of release of diclofenac sodium through polymeric films poly(lactic acid)-based prepared for ophthalmic treatment** 154
M. Carranza-Oropeza¹; E. Ongava¹; H. Inaba¹; L. Aguiar²; R. Giudici¹; ¹ Sao Paulo University, Sao Paulo/BR; ² Escola de Engenharia de Lorena (EEL/USP), Sao Paulo/BR

ENGINEERING OF HYBRID SYSTEMS

- P 64 **Modelling Pickering surfactant-free emulsion polymerization** 155
B. Brunier¹; N. Sheibat-Othman¹; Y. Chevalier¹; E. Bourgeat-Lami¹; ¹ University of Lyon, Villeurbanne/F

STIMULI RESPONSIVE POLYMERS

- P 65 **Grafting of Functional Brushes on the Surface of 5-Fluorouracil Molecularly Imprinted Polymer Particles through RAFT Polymerization** 157
R. Dias¹; D. Oliveira¹; M. Costa²; ¹ LSRE-Instituto Politécnico de Bragança/P; ² LSRE-Faculdade de Engenharia da Universidade do Porto/P
- P 66 **Sensor Array for Volatile Organic Compounds based on Doped Poly (2,5-dimethyl aniline)** 158
K. Stewart¹; A. Penlidis¹; ¹ University of Waterloo, Waterloo/CDN
- P 67 **Influence of the Polymer Structure over Self-Assembly and Thermo-responsive Properties: the Case of PEG-b-PCL Grafted Copolymers via a Combination of RAFT and ROP** 159
M. Sponchioni¹; R. Ferrari²; D. Moscatelli³; ¹ Politecnico di Milano, Vaiano Cremasco/I; ² ETH Zurich, Zurich/CH; ³ Politecnico di Milano/I
- P 68 **pH-sensitive comb-like polymers to deliver doxorubicin** 160
A. Agostini¹; S. Gatti¹; D. Moscatelli¹; ¹ Politecnico di Milano/I
- P 69 **Cationic Polymer-Based Nanoparticles for siRNA Delivery** 161
A. Cesana¹; L. Dragoni¹; D. Moscatelli¹; ¹ Politecnico di Milano/I
- P 70 **Grafting CO₂-responsive polymers from crystalline nanocellulose via nitroxide-mediated polymerization** 162
O. Garcia-Valdez¹; J. Arredondo¹; T. Brescacin¹; P. Jessop¹; P. Champagne¹; M. Cunningham¹; ¹ Queen's University, Kingston/CDN

urfactant-free emulsion

urfactant-free emulsion
erization

gulative mechanism was
ropriate. No micelles are

s affected by the rates of
icles.

hat the layer of inorganic
not affect radical entry
rostatic interactions or

the presence of inorganic
of the polymer particles
desorption as it concerns
lymer chains (generated
er, and do not contain
its that might interact with

ig:
the presence of inorganic
of the polymer particles
r partitioning.

on the polymer particles

etween the phases:

n the aqueous phase and
'particles' was found to
erm at very low clay
 1.5 g L^{-1}), but at higher
platelets were found to be
on the surface of polymer
ccess of clay (1.34 g L^{-1})
water if polymer particles
nates the possibility for

cy:
rs of clay platelets to the
density was modeled by
ameter. This contribution
ry close to one layer
ffect of lower layers).

cs and mechanisms. *Polym.*

ynamics of swelling of latex
1., 2, 269-274, (1993)
Sci., 9, 300-312, (1954).
clays platelets in Pickering

Grafting of Functional Brushes on the Surface of 5-Fluorouracil Molecularly Imprinted Polymer Particles through RAFT Polymerization

D. Oliveira¹, R.C.S. Dias^{1,*}, M.R.P.F.N. Costa²

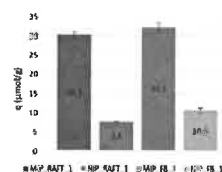
¹ LSRE-Instituto Politécnico de Bragança, Quinta de Santa Apolónia, 5300, Bragança, Portugal

² LSRE-Faculdade de Engenharia da Universidade do Porto, Rua Roberto Frias s/n, 4200-465, Porto, Portugal

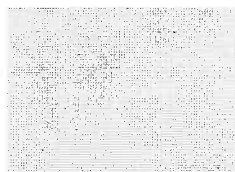
*Corresponding author: Rolando Dias, Email: rdias@ipb.pt

The grafting of functional brushes on the surface of molecularly imprinted polymer (MIP)-particles has been explored in the last few years to synthesize materials combining high molecular recognition capabilities and stimulation triggered by changes in the surrounding environment [1,2]. In the present work, MIP particles for 5-fluorouracil (a drug used in cancer treatment) were produced by precipitation polymerization in acetonitrile, using either MAA or HEMA as imprinting functional monomers, and in the presence of different kinds of RAFT agents. In a second step, taking advantage of the RAFT groups present in the surface of the particles, different kinds of functional polymer brushes were grafted on the MIPs considering a "grafting from" process in the presence of a RAFT agent. Introduction of pH-sensitive functional polymer brushes was carried out using again MAA and HEMA in this second stage, whereas temperature-sensitive MIP particles were sought by using NIPA to create the functional brushes (FB). The size of the functional polymer brushes grafted on the particles surface was measured through the SEC analysis of the free polymer formed on the second reaction step. A general kinetic modeling approach [3] was used to aid in the design of operation conditions leading to imprinting polymer networks with tailored properties and functional brushes with controlled size. Through comparative drug sorption measurements in imprinted/non-imprinted materials, it is shown that it is possible to achieve a good imprinting efficiency of 5FU (Figure 1). Moreover, comparison of drug release in particles with/without functional brushes allows to conclude that improved sensitivity to surrounding conditions is introduced in the grafted products.

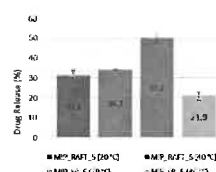
Indeed, change of 5FU release in acidic/alkaline (pH=2/10) conditions is possible for MIP particles with MAA or HEMA FB (Figure 2) and temperature dependent ($T=20/40 \text{ }^\circ\text{C}$) drug release is observed in products bearing NIPA grafted functional brushes (Figure 3).



(1) Molecular imprinting of 5FU



(2) Effect of pH on drug release



(3) Effect of temperature on drug release

References:

- [1] H. Zhang, Controlled/'living' radical precipitation polymerization: a versatile polymerization technique for advanced functional polymers. *Eur. Polym. J.* 49 (2013) 579-600.
- [2] G. Pan, Y. Zhang, X. Guo, C. Li, H. Zhang, An efficient approach to obtaining water-compatible and stimuli-responsive molecularly imprinted polymers by the facile surface-grafting of functional polymer brushes via RAFT polymerization. *Biosensors and Bioelectronics.* 26 (2010) 976-982.
- [3] M.R.P.F.N. Costa, R.C.S. Dias, An improved general kinetic analysis of non-linear irreversible polymerisations. *Chem. Eng. Sci.* 60 (2005) 423-446.