

THEMA 1: Thermoresponsives Polyelektrolytbasiertes Drug Delivery System an Knochenersatzmaterialien

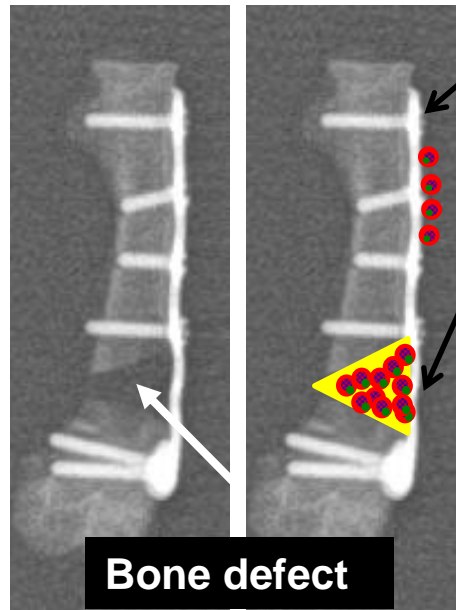
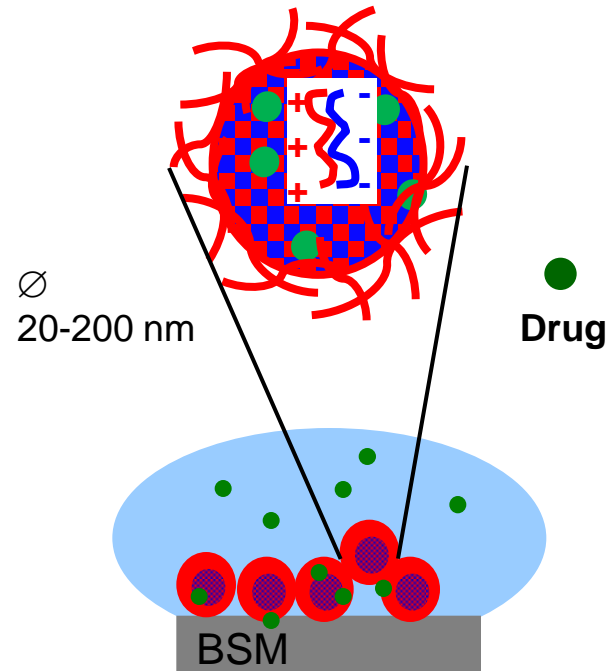
PD Dr. Martin Müller

Drug Loaded
Polyelectrolyte Complex
Nanoparticles (PEC NP)
(Project M7)



SFB / Transregio 79
Materials for tissue regeneration
within *systemically* altered bone

- *Osteoporosis & Multiple Myeloma*
- Gießen, Heidelberg, Dresden -



Osteosyn. Plate
- Ti alloys (M1)



A. Gebert, J. Eckert (M1)
IFW Dresden

Defect Filler

- Calcium phosphate cement (M2)
- Xerogel (CP, SiO₂, collagen) (M3)
- Hydrogel (Hyaluronic acid) (M9)



M. Gelinsky (M2)
TU Dresden



T. Hanke, H. Worch (M3)
TU Dresden

Options for drug loaded PEC NP

(A) Colloidal Stability

(B) Adhesiveness

(C) Sustained Drug Release

(D) Defined Cellular Effects

(E) Switchability

Polyelektrolyte

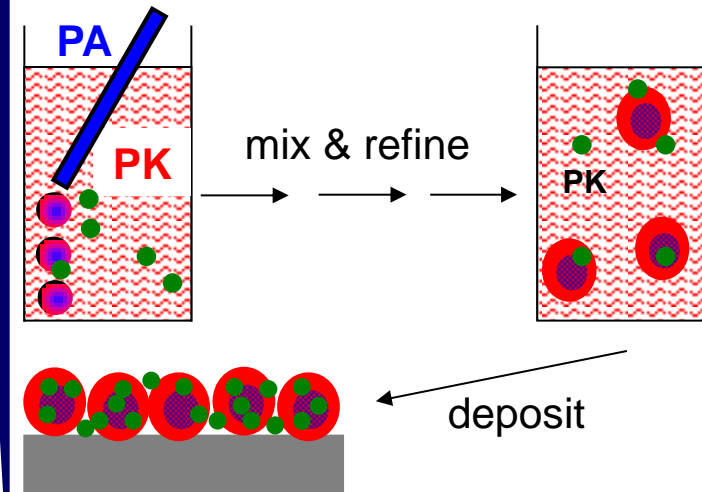
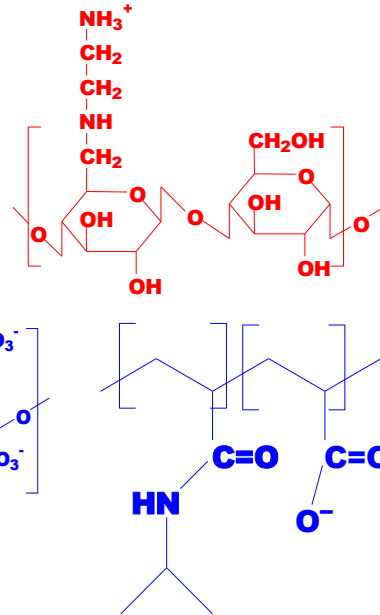
Poly(ethyleneimin) (PEI)

Ethylendiamino-Cellulose (EDAC)

Cellulosesulfat (CS)

Poly(N-isopropylacrylamid-co-acrylat)

(PNIPAAm_{0.80}-co-AA_{0.20})



Arzneistoffe (AS)

Bisphosphonate, Antibiotika,

Wachstumsfaktoren

Polykation/Polyanion/AS/AS Mischen

Kolloidtitration

n_+ : Molare kationische Einheiten

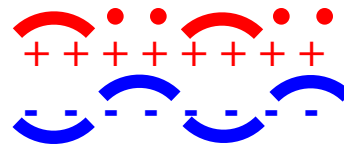
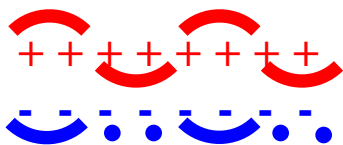
n_- : Molare anionische Einheiten

$$n_-/n_+ = 0.5$$

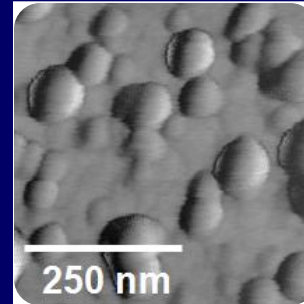
“PEC-0.5”

$$n_-/n_+ = 2.0$$

“PEC-2.0”



$$0.9 \leq n_-/n_+ \leq 1.1$$



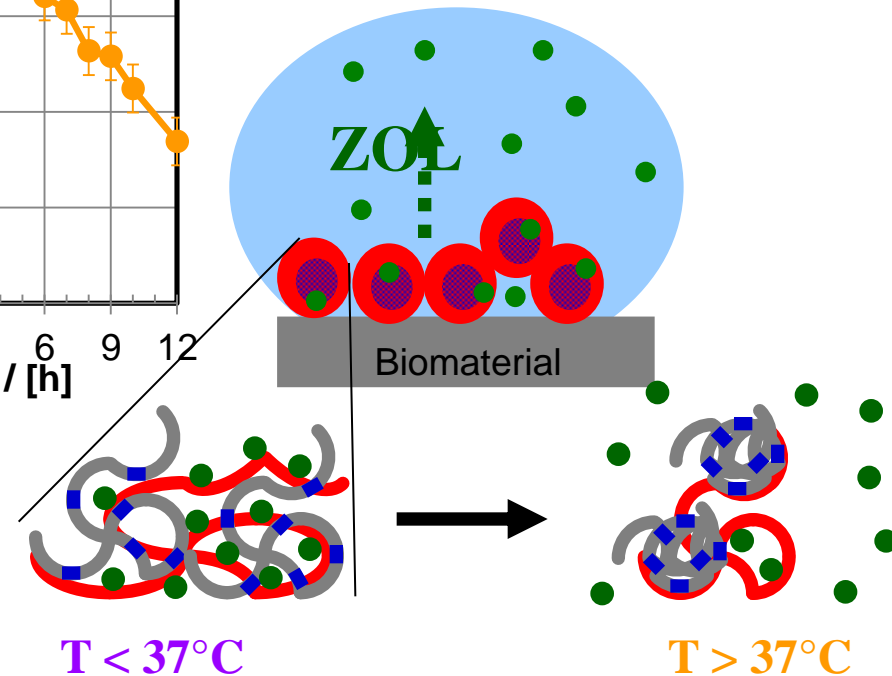
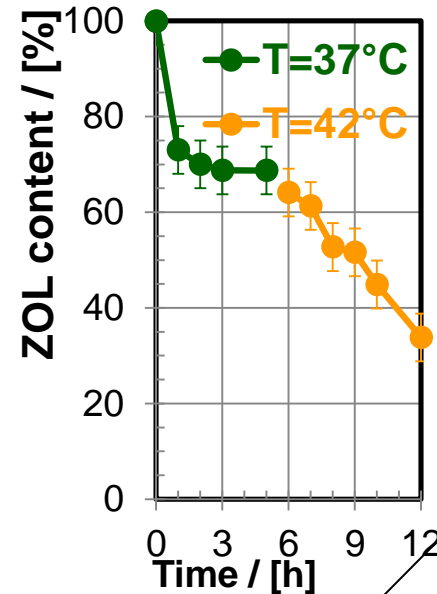
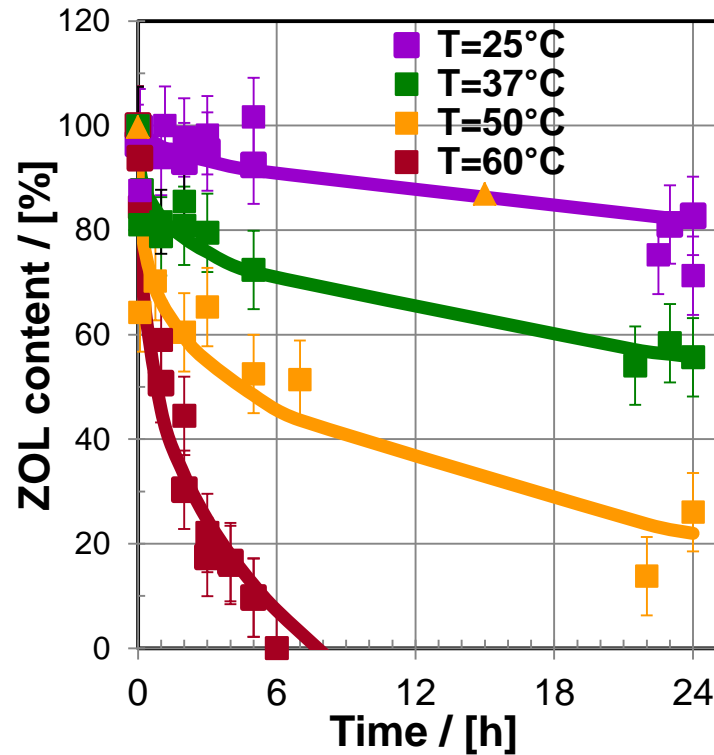
Vorteile:

- Einfach
- Wässrig
- Biokomponenten
- Größe, Form, Dichte, Ladung
einstellbar

US 9,078,805 B2 (2015)
EP 2 552 405 B1 (2017)
J. Pharm. Biomed. Anal. **2012**, 66, 183-190
Biointerphases **2013**, 8(1), 25
Biointerphases **2015**, 10(1) 011001
Nanomaterials **2016**, 6, 53
Coll. & Surf. B, **2017**, 151, 58

Kationische Cellulose/P(NIPAM-co-acrylat) @ Ge/GeO_x Modellsubstrat Zoledronat (ZOL)

Coll. Polym. Sci. 2017, 295, 1187-1199



- Temperaturinduzierte Freisetzung durch Konformationsänderungen des PNIPAM
- *Fragestellung: Wie kurz und gering kann eine Erhöhung oberhalb 37°C sein ?*