

The influence of chain architecture on polyelectrolyte functionalized mesopore accessibility

Robert Brilmayer¹ and Annette Andrieu-Brunsen¹

¹ Technische Universität Darmstadt; Ernst-Berl-Institut für technische und makromolekulare Chemie, 64289 Darmstadt, Germany

Author list: **Robert Brilmayer¹**, Annette Andrieu-Brunsen¹

Controlling nanoscale structure and function is highly important for the fabrication of functional materials which are used, for example, in sensing or drug delivery. In this context the controlled functionalization remains a challenge. In recent years it has been demonstrated that photoiniferter initiated polymerization (PIP) offer the possibility to adjust the polymer amount and with this ionic permselectivity in mesoporous membranes [1]. Based on results on zwitterionic polymers rendering mesopores bipolar and thus inaccessible to ions and calculations on charge transitions of poly(2-(methacryloyloxy)ethyl-phosphat (PMEP) in spatially confined pores, the question about the polymer chain architecture influence on mesopore performance attracted our interest [2, 3, 4].

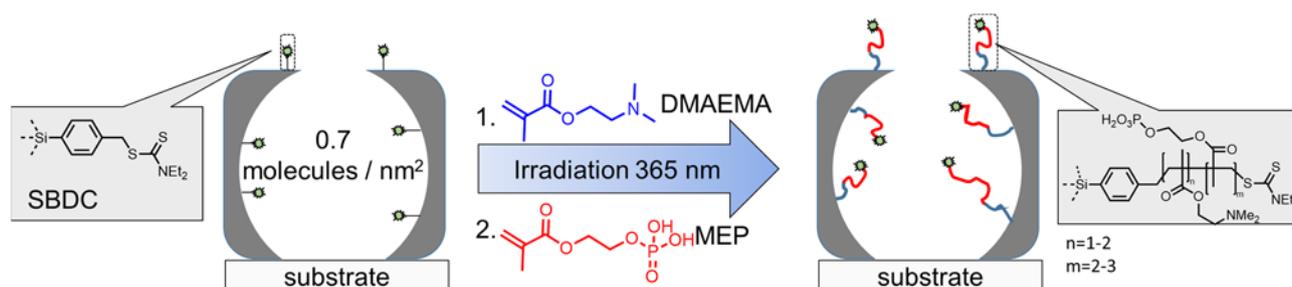


Figure 1. PIP based block copolymer formation in and outside of silica nanopores.

In this frame we present results on the functionalization of silica mesopores with block-copolymers using PIP (Fig. 1). Suitable candidates of interest to modulate charge density in mesoporous polymerhybrid films and thus to control their ionic permselectivity is the polyacid PMEPE as well as the 2-dimethylaminoethylmethacrylate (DMAEMA)-*co*-MEPE block copolymer [5, 6]. In accordance to molecular theory we only observe one *pK*s value for PMEPE confined into mesopores [4]. In addition, chains in a block like architecture show a different pH-responsive transport as zwitterionic polymers. Results on ionic permselectivity for mesoporous films of varying pore sizes in dependence of solution pH are presented.

- [1] L Silies et al., *Chem. Mat.* **27** (2015), 1971.
- [2] L Silies et al., *Langmuir* **34** (2017), 807.
- [3] A Calvo et al., *J. Am. Chem. Soc.* **131** (2009), 10866.
- [4] F Gilles et al., *J. Phys. Chem. C* **120** (2016), 4789.
- [5] A Brunsen et al., *Langmuir* **28** (2012), 3583.
- [6] J Tom et al., *Polymers* **9** (2017), 539.

Acknowledgement: The authors kindly acknowledge the financial support by the LOEWE Research Cluster “i-Napo” of the Hessen State Ministry of Higher Education, Research and the Arts.