

pH-Dependent Permselectivity of Polymer Functionalized Mesopores

Robert Brilmayer¹, Annette Andrieu-Brunsen¹

¹*Technische Universität Darmstadt; 64289 Darmstadt, Germany*

E-mail: brilmayer@cellulose.tu-darmstadt.de

Controlling nanoscale structure and function is highly important for the fabrication of functional materials which are used, for example, in the fabrication of nanodevices for sensing or drug delivery. Whereas the structure of nanopores and -channels can be well controlled through self-assembly or track etching processes, the controlled functionalization remains a challenge. Especially, photoiniferter initiated polymerization offers the possibility to adjust the polymer amount in mesoporous membranes.[1] Choosing the right functional monomer, this can be used to adjust charge density in- and outside of mesopores. Inspired by natural ion channels, the pH dependent ion-permselectivity of nanometer sized pores based on functional polymers and their grafted amount plays an important role in transport control. A suitable candidate to modulate charge density in mesoporous polymerhybrid films and thus to control their ion-permselectivity is the polyacid poly(2-(methacryloyloxy)ethyl-phosphat (PMEP).[2] Depending on the environmental pH, PMEPE can exist in three different charged states. Together with theoretical results on charge transitions of PMEPE in spatially confined pores,[3] this attracted our interest in PMEPE amount modulation in pores with the aim not only to tune ionic mesopore accessibility but as well to understand eventual confinement effects. Results are obtained by cyclic voltammetry for mesoporous films of varying pore sizes in dependence of solution pH. Information on ionic mesopore accessibility will be compared to results on photospectroscopic investigations using pH-sensitive fluorescence dyes inside mesopores as “pH”-readout function.

References

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