

## Imbibition of a Single Polymer into a Nanocapillary

Alexander Detkov<sup>1</sup>, Wylie Stroberg<sup>2</sup>

<sup>1</sup>Department of Engineering Physics, University of Alberta, Edmonton, Canada

<sup>2</sup>Department of Mechanical Engineering, University of Alberta, Edmonton, Canada

### ABSTRACT

Mesoporous micro- and nanoparticles have a wide range of applications in targeted drug and gene delivery and medical imaging. Despite the loading of drug molecules or nucleotide segments into the nanoscale pores being essential to their efficacy, there are few guiding principles for the imbibition process. In this work we simulate the imbibition of a dilute mixture of a short polymer into a nanoscale pore. We determine the depth within the pore at which the polymer adsorbs as a function of the pore-polymer affinity. Additionally, we determine the residence time of an adsorbed polymer based on the deposition depth and mobility following imbibition. Interestingly, we find that residence time is maximal for polymers that have intermediate affinity for the pore wall, suggesting a design principle for creating long-lived porous particle-polymer complexes.

Word count: 131