Critical Casimir forces between polymer surfaces

Shreyas K Vasantham*, Manfred Heuberger

Advanced Fibers, Empa, Swiss Federal Laboratories for Material Science and Technology, St. Gallen, Switzerland

** shreyas.vasantham@empa.ch*

Supercritical CO_2 has been well known to facilitate polymer processing. [1] Interaction forces acting inside nano-pores determine the final polymer morphology. We study these forces in a model slit pore between polymer bearing surfaces, taking advantage of a custom built high pressure surface force apparatus. A previous study of sc CO_2 between mica surfaces reported long range attractive forces, so called critical Casimir forces, when the critical point of CO_2 was approached and "supercritical" Casimir forces along the extension of the coexistence line. [2]

Our work further extends these findings into the realm of polymers to experimentally assess such Casimir forces operating at the pores of polymers under confinement. Furthermore, adhesion studies between supercritically solvated polymer surfaces can readily be conducted across the entire pressure-temperature phase diagram of CO_2 in the temporal and spatial scales. These insights are expected to be beneficial for processing of polymers and may therefore be translated to industrial levels.

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[1] S. G. Kazarian, *Polymer Science, Ser: C*, 2000, **42**, 78-101.
[2] Erich Schurtenberger, Manfred Heuberger, *Journal of Supercritical Fluids,* 2012*,* **71***,* 120– 126.