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Mass Superflux in Solid Helium: What Limits the Flux?[1]
ROBERT HALLOCK, YEGOR VEKHOV, Univ. of Mass. - Amherst — The thermo-mechanical effect in superfluid helium is used to create a chemical potential difference, $\Delta\mu$, across a superfluid-filled vertical Vycor rod. This rod separates a bulk liquid superfluid helium reservoir, $R1$, on the top of the Vycor at $T1 = 1.46 - 1.51$ K and solid hcp ^{4}He on the bottom at $TC = 0.1 - 0.8$ K. Two *in situ* capacitance pressure gauges, $C1$ and $C2$, are placed at the ends of the horizontal cylindrical solid helium sample (1.84 cm^3, $25.9 - 26.4$ bar) and located at different distances from the position of the Vycor rod in the solid helium, 10 and 31 mm, respectively. A $T1$ decrease/increase changes $\Delta\mu$ and leads to a solid helium pressure increase/decrease detected by both Cs. The rate of pressure change is slower at the further gauge, $C2$, than at the nearer one, $C1$. This behavior is interpreted as due to the presence of a mass flux bottleneck inside the solid helium sample. We believe, e.g. in the case of a $T1$ decrease, that helium atoms emerge from the Vycor rod, perhaps migrate along the superfluid core of edge dislocations in solid helium and adsorb on them. This is the so-called "syringe-effect" or superclimb of edge dislocations. The dependence on temperature will be discussed.

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