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Phase diagram for helium films on lithium substrates.[1] E. VAN CLEVE, J. C. BURTON, P. TABOREK, University of California, Irvine — We have used an in situ cryogenic pulsed laser deposition system to deposit a lithium film onto a quartz crystal microbalance. Helium 4 adsorption isotherms were measured on a lithium substrate between 2K and 0.6K. Features of these isotherms such as superfluid mass decoupling and variations in the dissipation were used to construct a phase diagram for helium films including the KT line and the 2D liquid-vapor coexistence region. The liquid-vapor critical temperature is approximately 0.8K. The KT transition is anomalous inside the 2D liquid-vapor coexistence region, occurring at constant sub-monolayer coverage independent of temperature. No inert solid-like layers of helium form on lithium substrates, so superfluid films are in direct contact with the substrate. These results will be compared and contrasted with the behavior of helium on other intermediate strength substrates such as exfoliated graphite pre-plated with hydrogen, sodium and magnesium.

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E. Van Cleve
University of California, Irvine

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