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Excitations of metastable superfluid ^{4}He at pressures up to 40 bars JONATHAN PEARCE, Institut Laue-Langevin, France and University of Delaware, JACQUES BOSSY, Centre de Recherche sur les Très Basses Tempèatures, France, HELMUT SCHOBER, Institut Laue-Langevin, France, HENRY GLYDE, University of Delaware, DAVID DAUGHTON, University of Delaware, NORBERT MULDERS, University of Delaware — We have performed neutron scattering measurements [1] of the fundamental excitations of liquid ^{4}He confined in 44 Å pore diameter gelsil glass at pressures up to 40 bars in the wave vector range $0.4 < Q < 2.3$ Å^{-1}. At pressures above 25.3 bars and at low temperature ($T = 0.4$ K) the characteristic phonon-roton mode of superfluid ^{4}He is no longer observed as a well-defined mode in the phonon-maxon region ($0.4 < Q < 1.6$ Å^{-1}). Modes at wave vectors $Q > 1.6$ Å^{-1}, especially the rotons, are observed up to complete solidification of all the liquid at $p \sim 40$ bars, where the roton disappears. Simultaneous neutron diffraction measurements show the existence of Bragg peaks at and above 35.1 bars, indicating co-existence of liquid and solid in the pores at pressures $35 \leq p \leq 40$ bars. These measurements are presented in conjunction with a measurement of the phase diagram of this system using ultrasound.

[1] J. V. Pearce et al. Phys. Rev. Lett. 93, 145303 (2004)

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