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Direct Measurement of the Pressure Dependence of the Glass Transition Temperature: A Comparison of Methods[1] WILLIAM OLIVER III[2], TIMOTHY RANSOM, JAMES COOPER III, University of Arkansas — Two methods for the direct measurement of the pressure dependence of the glass-transition temperature T_g are presented and compared. These methods involve the use of the diamond anvil cell (DAC), and hence, enable the ability to measure $T_g(P)$ to record high pressures of several GPa. Such studies are increasingly relevant as new methods have pushed other high-pressure experimental investigations of glass-forming systems into the same pressure regime. Both methods use careful ruby fluorescence measurements in the DAC as temperature is increased from the glass ($T<T_g$) to the viscous liquid ($T>T_g$). Method 1 observes the disappearance of pressure gradients as the viscous liquid region is entered, whereas method 2 involves observation of slope changes in the P-T curve during temperature ramps. Such slope changes are associated with the significant change in the volume expansion coefficient between the highly viscous, metastable, supercooled liquid state and the solid glassy state. In most cases, the two methods yield good agreement in the $T_g(P)$ curve. Data will be presented for more than one glass-forming system, including the intermediate strength glass-forming system glycerol and the fragile glass former salol.

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