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Polycrystalline specimens of end-member CaTiO<sub>3</sub> and intermediate CaTi<sub>0.75</sub>Si<sub>0.25</sub>O<sub>3</sub> and CaTi<sub>0.5</sub>Si<sub>0.5</sub>O<sub>3</sub> perovskites were hot-pressed in a 2000-ton uniaxial split-sphere apparatus (USSA-2000). Intermediate compositions were synthesized at pressures of 15 GPa and temperatures above 1800 K. The pressure-volume-temperature (P-V-T) behavior in these specimens has been studied using a DIA-type, cubic-anvil apparatus (SAM85) and *in situ* synchrotron X-ray diffraction at the superconducting wiggler beamline (X-17B) of the National Synchrotron Light Source at Brookhaven National Laboratory. The P-V-T data to pressures of 8 GPa and temperatures of 1100 K were analyzed using a temperature-dependent Birch-Murnaghan equation-of-state to obtain the isothermal incompressibility/bulk modulus and its pressure and temperature derivatives.