Electronic thermal pressure and T-P-V equation of state of gold

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   We calculate the electronic thermal pressure of Au at temperatures up to 20000 K for four compressions $V/V0$ = 1.0, 0.88, 0.76, and 0.64 (where V is the volume and V0 the ambient volume), using the uniform electron gas model with the random-phase approximation for the exchange-correlation potential, in order to see the magnitude of the electronic thermal pressure at high temperatures and high pressures found in multi-anvil, laser heated diamond-anvil experiments, or shock compression measurements for metals.   We find the electronic thermal pressure difference from 300 K on each isochore is relatively insensitive to compression.   At $V/V0$ = 1.0 and T = 2000, 5000, and 10000 K, we obtain the electronic thermal pressure difference from 300 K to be 0.087, 0.549, and 2.065 GPa, respectively.   We thus confirmed the calculation results by Tsuchiya and Kawamura(2001) that the effect of the electronic thermal pressure on the total thermal pressure of Au is insignificant at least up to a few thousand K.   The accuracy of previously proposed T-P-V equation-of-states of Au is discussed for their use as pressure calibration standards at high temperatures and high pressures.