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Optical characterisation of gold films for time-resolved reflectance thermometry measurements JASMINA MUSIC, THOMAS G. WHITE, DAVID J. CHAPMAN, DANIEL E. EAKINS, Institute of Shock Physics, Imperial College London — The measurement of temperature represents a long-standing challenge within the field of high-pressure science. Recently, a promising time-resolved reflectance thermometry technique employing embedded gold films has been demonstrated. As an active diagnostic, reflectance thermometry is well suited for dynamic experiments generating temperatures below 1000K, where passive diagnostics such as pyrometry become infeasible due to the transient states created. A critical component of the reflectance thermometry technique is a robust optical characterisation of the gold films, decoupling the thermal and pressure contributions. Additionally, the optical properties of gold vary with both sample preparation and thermal history. With a view towards the development of a spatially-resolved reflectance thermometry technique for temperature measurement, we report the optical characterisation of a range of commercially available or deposited thin film gold samples. Reflectance spectroscopy was performed on the gold films as a function of temperature from ambient conditions to 400K, and as a function of pressure using a diamond anvil cell. The experimental data are fitted to a simple phenomenological Drude model paving the way for the calibrated films to be used during future dynamic experiments.

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