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High Temperature High Pressure Emissivities JEFFREY NGUYEN, REED PATTERSON, LORIN BENEDICT, JOHN KLEPEIS, NEIL HOLMES, Lawrence Livermore National Laboratory — Accurate temperature measurements at high temperatures and pressures require knowledge of the optical emissivity as a funcition of wavelength at similar conditions. Presently, many temperature measurements at extreme conditions assume a constant ambient-condition emissivity. Or, emissivity is often derived solely from a fitting procedure. From our ellipsometric measurements of phase transitions under dynamic compression, we observed changes in the complex dielectric constants of various solids and liquids. Since the optical emissivity is uniquely determined from the complex dielectric constants, we expect emissivity to change upon phase transition. Thus careful considerations must be given to materials with complicated phase boundaries. We will present here results on various solid- solid, solid-liquid and liquid-solid phase transitions. In particular, we will focus on the change in emissivity at the (α,ϵ) phase boundary in Fe and its implications for the Fe phase diagram. Work performed under the auspices of the U.S. DOE at the University of California/Lawrence Livermore National Laboratory under contract W-7405-ENG-48.

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