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Emissivity corrected pyrometry of reactive multilayers. DARCIE FARROW, MICHAEL ABERE, STEPHEN RUPPER, THOMAS CONWELL, ALEXANDER TAPPAN, DAVID ADAMS, Sandia Natl Labs — Ignition of sputter deposited nano-laminates results in rapid, self-propagating reactions. Due to high (10's of m/s) reaction front velocities, temperatures in the 1,000's of K, and rapid phase changes occurring during reaction, direct measurement of temperature has proven difficult. This work presents a pyrometry technique with sub-microsecond time resolution, 10^{-6} m spatial resolution, and real time calculation of emissivity. By modulating a laser at 100 kHz and then Fourier processing the summed signal of emission and modulated reflectance, this emissivity corrected pyrometer overcomes the traditional limitations of two-color pyrometery for samples that do not follow the grey body approximation. The instrument has allowed for the direct measurement of temperature in NiAl and AlPt flame fronts, which allows for a determination of heat loss from an adiabatic condition. Further, a bilayer thickness dependence study has shown the relationship between front propagation velocity and flame temperature. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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