Mid-infrared photothermal imaging is a novel chemical imaging modality that combines high sensitivity with enhanced spatial resolution. Subcellular features in fibroblast cells and tissues are imaged and analyzed with regards to their molecular structures without the need of exogenous fluorophores at a resolution that overcomes the diffraction limited spot size of the mid-infrared excitation beam. With a phase-sensitive lock-in detection scheme, changes in the thermal diffusion properties can be detected and can provide a complementary sample characterization.