Micromechanical photothermal infrared spectroscopy is a promising technique, where absorption-related heating is detected by frequency detuning of microstring resonators. We present photothermal infrared spectroscopy with mechanical string resonators providing rapid identification of femtogram-scale airborne samples. Airborne sample material is directly collected on the microstring with an efficient nondiffusion limited sampling method based on inertial impaction. Resonance frequency shifts, proportional to the absorbed heat in the microstring, are recorded as monochromatic IR light is scanned over the mid-infrared range. As a proof-of-concept, we sample and analyze polyvinylpyrrolidone (PVP) and the IR spectrum measured by photothermal spectroscopy matches the reference IR spectrum measured by an FTIR spectrometer. We further identify the organic surface coating of airborne TiO2 nanoparticles with a total mass of 4 pg. With an estimated detection limit of 44 fg, the presented sensor demonstrates a new paradigm in ultrasensitive vibrational spectroscopy for identification of airborne species.