

A. Elizabeth Griffith, M.Y. Louge and Jamaludin Mohd. Yusof: "Simultaneous, Non-invasive Measurements of Convective Heat Transfer and Solid Volume Fraction at the Wall of an Entrained Gas-Solid Suspension," *Rev. Sci. Instrum.* **71**, 2922-2927 (2000).

We describe an instrument for local, instantaneous, non-invasive, simultaneous measurements of solid volume fraction and convective heat transfer at the wall of a vertical tube containing a relatively dense, entrained suspension of gas and fine solids. The instrument combines a small platinum coil and a guarded capacitance sensor. The capacitance sensor records instantaneous solid volume fraction in the near vicinity of the wall. The coil is maintained at constant temperature by a rapid anemometer bridge circuit. The vessel is wrapped in electric heaters to avoid artificially high rates associated with developing heat transfer and to minimize conduction losses from the coil. Using a model capturing these losses, convective heat transfer rates are inferred from the power input to the coil. The instrument is tested in a cold circulating fluidized bed riser. The temporal response of the thermal sensor is faster than 30 ms.

