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Sub-microgram differential AC calorimetry ANDREAS RYDH, R. XIE, S. SMITH, J. E. PEARSON, R. DIVAN, U. WELP, W. K. KWOK, Materials Science Division, Argonne National Laboratory, M. R. ESKILDEN, Department of Physics, University of Notre Dame — We have developed a differential, steady-state AC microcalorimeter based on a Si_3N_4-membrane with thin film heaters and thermocouples for studies of sub-microgram samples. The calorimeter shows good absolute accuracy down to 1 K and excellent performance with high resolution, $\Delta C/C < 10^{-5}$, without temperature smearing. This is exemplified by measurements of the superconducting transition of a 650 ng YBCO single crystal. The addenda heat capacity is found to be less than 1 μJ/K at room temperature and decreasing steadily with decreasing temperature to below a few nJ/K at 1 K. Key features of the microcalorimeter include constantan heater meanders, Au- 2.1%Co versus Cu film thermocouples, and a novel, differential measurement method. The small size and differential design makes the device ideal for characterizations of tiny single crystals in strong magnetic fields, but the potential of the calorimeter to be used for studies of bio-organic liquid droplets will also be discussed. Support from Fulbright, the Sweden-America Foundation, and U.S. Department of Energy, Basic Energy Science under Contract W-31-109-ENG-38 is acknowledged.

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