Batch Calorimetry with Solids, Liquids and Gases in Less Than 1 mL Total Volume

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An add-on batch delivery system for the Calorimetry Sciences Corp. model 4200 heat-conduction calorimeter has been built and tested. The batch injector is made of Hastelloy-C and has a volume of 115 microliters that can be injected into 300 to 750 microliters of liquid in the calorimeter ampule. The system was tested with reactions of dry N_2 gas with H_2O, HCl(aq) with aqueous tris(hydroxymethyl)aminomethane (tris), KCl(s) with H_2O, tris(s) with HCl(aq), Zn(s) with HCl(aq), and 2-propanol with H_2O. The precision of a heat measurement is 2-3 mJ or 2-3%. The system is thus useful for measuring heats of solution of solids and gases in liquids, heats of reaction of solutions and suspensions, heats of mixing of nonaqueous liquids, heats of wetting of solids and heats of reaction of metals with acids and bases with milligram amounts of reactants. The design, construction and examples of data from this calorimeter will be presented.