

A new era in hydrofluoric acid solution calorimetry: Reduction of required sample size below ten milligrams

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ABSTRACT

Significant advances have been made in hydrofluoric acid solution calorimetry at Lafayette College in the past 15 years. To determine the degree to which these developments enable the reduction of sample size, calorimetric experiments were performed on hexagonal germanium oxide as a function of sample weight. The resulting calorimetric data indicate that the highest degrees of reproducibility ($\pm 0.1\%$) are maintained down to sample sizes of 50 mg, and that precisions of $\pm 1\%$, acceptable for many applications, are observed to sample sizes of 10 mg. Because silicate systems produce weight-based heats of solution that are about twice that of germanium oxide, the required sample size for these will be even less. The new minimum required sample size of 5 to 25 mg (depending on application) is about two orders of magnitude less than that used 20 or 30 years ago. This makes possible many new kinds of projects for HF solution calorimetric investigation, including those on high-pressure materials.