Measurement Acceptance Criteria:
Standards, Principles, and Required Documentation

A goal of this Gen3CSP project is to establish a thermophysical property database of high temperature (700-1250 °C) (i) heat transfer media (HTMs) and (ii) containment materials (CMs). This database will be made public containing thermophysical properties collected using (a) our electrothermal immersion technique, (b) our modified photothermal technique, and (c) from third parties (*i.e.*, literature and other Gen3CSP collaborators). This document outlines criteria for an "acceptable" measurement or dataset to be included in this database and the accompanying supporting information.

Acceptable Measurement Criteria: Thermophysical property (thermal diffusivity, thermal conductivity, and specific heat) measurements performed for the Gen3CSP program will meet the following criteria:

1. Sufficient details to identify the material (*e.g.*, composition, vendor's product/catalog ID number, *etc.*),
2. Nominal measurement value,
3. Measurement conditions (*e.g.*, temperature, N_2/Ar environment, *etc.*),
4. Uncertainty quantification individually reported with each measurement,
    a. Measurement uncertainty of less than 15% of the nominal value is preferred, but exceptions can be made for difficult/exotic materials.
    b. Monte-Carlo uncertainty is the preferred approach when using a multi-parameter thermal model; simplified quadrature uncertainty can be used when an analytical relation exists.
5. Reference to appropriate measurement standard or supporting peer-reviewed publication detailing the measurement technique.

This data will be made available to the public with each measurement set that is curated in this thermophysical property database via a web interface hosted at Georgia Tech. Raw data of each measurement will be curated separately but will be made available for subsequent analysis upon request. Each dataset included in the database will be reviewed by senior personnel (*i.e.*, the PI, Co-PI, Research Engineer/Scientist, Postdoc, etc.) to ensure that these criteria are met.

Notes:

(a) Our electrothermal immersion technique is a modification of the 3-omega technique that can be immersed in a high temperature fluid. This technique is currently under development (as of January 2019). This technique will be qualified by using known standards allowing for at most 10% variation from the accepted value. The technique methodology will be documented in a peer-reviewed publication.

(b) Our modified photothermal technique is a modification on the flash diffusivity technique. Specifically, this technique has been modified to use infrared optics to correct for collimator/aperture effects that become pronounced at high temperatures. This instrument was purchased from Netzsch (LFA 467 HT Hyperflash®) and modifications are underway. To measure the volumetric specific heat of bulk samples, we will use a modified DSC/TGA purchased from Netzsch (STA 449 F3 Jupiter®) with modification to the platinum furnace and sample holders specifically designed for more accurate specific heat measurements (and not phase transitions). The manufacturer's specific heat uncertainty is claimed at 3.5%; this will be verified through testing known standards.

(c) Third party measurements from others within the Gen3CSP program and beyond will also be welcome, but we will insist upon the aforementioned criteria for inclusion in the database.