

### Reference vs. Certified Reference

According to the National Institute for Standards and Technology (NIST), Reference Materials and Certified Reference Materials may be defined as follows:

**Reference Material:** Material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.<sup>1</sup>

**Certified Reference Material:** Reference material characterized by a metrologically valid procedure for one or more specified properties, accompanied by a certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability.<sup>1</sup>

The primary difference between these two materials is that a Certified Reference Material, or NIST Certified Reference Material, has been verified through a standardized method of manufacturing and testing to prove an ultra high purity and the ability of the material to achieve a specified physical property. A Reference Material is said to achieve the specified material property based solely on literature specifications which have been observed through testing.

### ICTAC Calibration Reference

The International Confederation for Thermal Analysis and Calorimetry fosters collaboration and communication among the world's various thermal analysis groups, committees, and conferences. This organization has identified 6 primary metals and alloys which allow for a broad range of Curie Points for the use with Thermogravimetric Analysis (TGA). This organization does not produce or certify the materials listed as ICTAC Certified.

### Choosing the Best Fit

Choosing the best reference material relies heavily on the required level of accuracy and precision in testing methodologies employed. Inherently, according to ASTM E-37 standards governing Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) devices and testing methods, all calibrated units have a error ranges for single user (DSC:  $\pm 0.41$  °C<sup>1</sup> TGA:  $\pm 1.92$  °C<sup>2</sup>), and among labs (DSC:  $\pm 0.48$  °C<sup>1</sup> TGA:  $\pm 3.85$  °C<sup>2</sup>). Due to this error, a standard Reference Material with 99.99% to 99.999% purity will allow for calibration for the majority of needs.

When selecting between Certified Reference and Reference Standards, review the following requirements:

*Certified Reference Material:*

1. Industry Standard or Requirement for testing.
2. Use of a super/ultra high resolution testing device.
3. High precision and accuracy research.

*Reference Material:*

1. General use testing device.
2. Non-research testing or quality control.
3. Older model thermal analysis units.
4. Training purposes.
5. Industry Standard or Requirement not listed as Certified Reference Material required.

For research or methods conducted to a standard, such as ASTM, ISO, or FDA, a Certified Reference Material, or similar, may be required. Beyond these needs, Reference Materials by EA Labs will allow users excellent precision and accuracy within the lab setting.

## References

1. NIST "SRM Definitions" 2019 <https://www.nist.gov/srm/srm-definitions>
2. ICTAC [www.ictac.org](http://www.ictac.org)
3. ASTM E967.18, Section 12. *Precision and Bias*, 2017
4. ASTM E1582-17, Section 13. *Precision and Bias*, 2017