

On the difference between a ‘reference material’ and a ‘material reference’

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At the occasion of its 50th anniversary in 2011, the Institute for Reference Materials and Measurements, IRMM, of the Joint Research Center of the European Commission, organized an International Conference on ‘The Future of Reference—Science and Innovation’ on 23–25 November at IRMM in Geel, Belgium; see a Meeting Report in *Accred Qual Assur* (2011) 16:327–328. The contributions to that Topical Issue of *ACQUAL* are related to presentations at this Conference. The opening of the Conference consisted of the inauguration of an impressively large and well-equipped new building for the production and certification of Reference Materials by EC Director-General Heinz Zourek for Enterprise and Minister-President of Flanders, Kris Peeters. Two rather important events intended to serve Metrology in Chemistry for the European Union and, in fact, for the whole world.

The occasion to devote our attention to the role of (certified) reference materials.

The English language has this remarkable feature in scientific as well as in daily parlance, of admitting the ‘adjectival’ use of a noun to another noun whereby a noun is used as an adjective to another noun. There are many examples of that: morning paper, London Underground, Labour party, etc. The first noun in the examples given qualifies more explicitly the meaning of the second noun.

At first sight, the adjectival use of the noun ‘reference’ (entry 2.6–1 in [1]) to the noun ‘material’ indicates that ‘material’ is the most important feature of the certified reference material CRM. The (adjectival) noun indicates that the material is *intended* to be used as a ‘reference’.

Is that what we really *intend* to say?

To answer that question, we need to recognize the use we *intend* to make of the CRM. Will we use it as a ‘trueness control material’ (unfortunately not defined in the International vocabulary of metrology—VIM [2], or as a ‘calibrator’ (entry 5.12 in [2])? A trueness control material serves the purpose of applying a correction (entry 2.53 in [2]) to compensate for a systematic effect (entry 2.17 Note 2 in [2]) somewhere in the process of ‘measurement’. A calibrator serves the purpose of calibrating a measurement.

Is ‘material’ the most important role we expect from a CRM? Or is it the ‘reference’?

When we compensate for a systematic effect when performing a measurement, we clearly do that by way of a multiplication factor. Such a factor can be determined comparing a measurement of the value embodied in the CRM and the certified value provided by the certifying CRM producer. This is a numerical operation needing a numerical value and cannot be performed using a material.

Conclusion: The really important feature of a CRM we use is the certified *value* embodied in (or carried by) the ‘material’. The feature ‘reference’ is more important than the feature ‘material’. The latter only serves as a *carrier* of the former.

That does not correspond to the hierarchy in the terminology we use, and where we concluded that the material was the most important feature.

Remarkable

Why do not we use the most important term in the terminology to express the most important feature exploited in the *intended* use of the CRM? In other words: why do not we use the concept ‘material reference’ where the ‘reference’ is represented by the noun (which is more important

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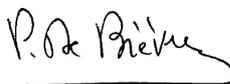
than its adjective), and where ‘material’ is used adjectivally?

The explanation may be trivial. When we talk about measurement standards, the first example which jumps to our mind is the kilogram. Quite understandably so because we have been told about the kilogram in high school. It is the Pt-Ir piece of metal agreed internationally as our ‘primary measurement standard’ (entry 5.4 in [2]) for mass. So we refer to the material, a piece of Pt-Ir in Paris. But, upon closer examination, what we actually are interested in, is the value embodied in that material i.e. ‘1’ (the mass of the kilogram is ‘1 kg’ by definition). Thus, when we refer to the kilogram as primary measurement standard, we sometimes refer to the piece of material and sometimes to the value embodied in the material. In the case of the kilogram, the same term ‘standard’ is used to designate both the material as well as the certified value embodied in the material. We have not been educated to make the distinction between two different concepts (material and value) described by only one term (kilogram). So we always confounded the two.

In the case of a primary measurement standard in chemical measurement, it should be imperative to make the distinction between the two different concepts ‘material’ and ‘reference’ by using two different terms. Indeed, we use the value to correct or calibrate our measurement, not

the material. Since the ‘reference’ embodied in the ‘material’ is the most important feature in a ‘certified reference material’, why do not we call it ‘certified material reference’?

In all likelihood we will not want to change our habit of using the term certified reference material because the term CRM has been enshrined in our minds for too long. However, when we think and use CRM, we should always keep ourselves keenly aware of the difference between the two concepts involved.



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