

Fischer Traceability Report VR 2012 05

On the re-calibration of Pt-foil and Pt/Si Reference Standards

The production of a new 5 μm thick pure Pt foil (code BAS PT 5 16 09 11) characterized by gravimetry /1/ is the basis of this re-calibration. This primary standard is checked for consistency with the previously used secondary standards¹.

Experimental

Fischerscope[®] XUV-S, 50 kV, 0.5 mm Al-primary filter. Aperture \varnothing 1 mm. The size of the primary standard is 5 cm * 5 cm. In order to get a representative mean value of the entire primary standard a scan of 8*8 readings has been performed. The WinFTM scanning mode² has been applied to cover a large spot by a single measurement.

The other secondary standard "master" foil samples were measured in the central area using the same scanning mode setups. In addition, four additional foil samples have been analysed in order to complete the set secondary standards. The measuring time is the same as for the primary standard foil (300 s).

The foils were placed on a particular sample holder ("radiation trap") to avoid the excitation of radiation components from the surrounding chamber.

Since the measuring distance affects the geometry factor, it must be fixed within a small tolerance. The Fischerscope[®] X-ray system's autofocus tool achieves an acceptable range of about 20-50 μm .

Results of re-calibration

All values are μm of Pt, converted from the mass per unit area data with the density of Pt = 21.4 g/cm^3 . The following Tabs.1-3 give the experimental standard free results of the samples under investigation. The deviations of the standard free experimental results with respect to the stated values are given in the following Figs. 1.

Tab. 1 Measuring results of the 2 old secondary standards (ABWUU, ABWUO) and of the new primary standard BAS PT 5 16 09 11.

Code	stated value	exp.	re-calibrated	measuring uncertainty (k=1)
BAS PT 5 16 09 11	5.156	5,209	5.156	-
ABWUU	2.65	2.626	2.60	0.03
ABWUQ	2.67	2.693	2.66	0.03
empty sample holder	0	0.0004		-

¹ Master standard (Gebrauchsnormal)

² The motorized table moves both in x- and y- direction with predefined velocities and predefined distances. These so-called scan parameters are defined in the WinFTM product. Here a scan area of 2 mm * 2 mm has been used.

Tab. 2 Measuring results of the 4 additional secondary foil standards. Calibration by the results of Tab. 1.

Code	exp.	re-calibrated	measuring uncertainty (k=1)
VCBF	0.093	0.090	0.001
ADMUR	0.21	0.215	0.003
ADMUS	1.203	1.19	0.015
AAQCD	5.146	5.09	0.06

Tab. 3 Measuring results of the 6 new secondary standards Pt/Si. Calibration with the results of Tab. 1.

Code	exp.	re-calibrated	measuring uncertainty (k=1)
ADXCG	0.1435	0,142	0,0014
ADXCH	0.1452	0,144	0,0014
ADXCJ	0.100	0,099	0,0010
ADXCJ	0.1005	0,099	0,0010
ADXCK	0.182	0,180	0,0018
ADXCL	0.183	0,181	0,0018

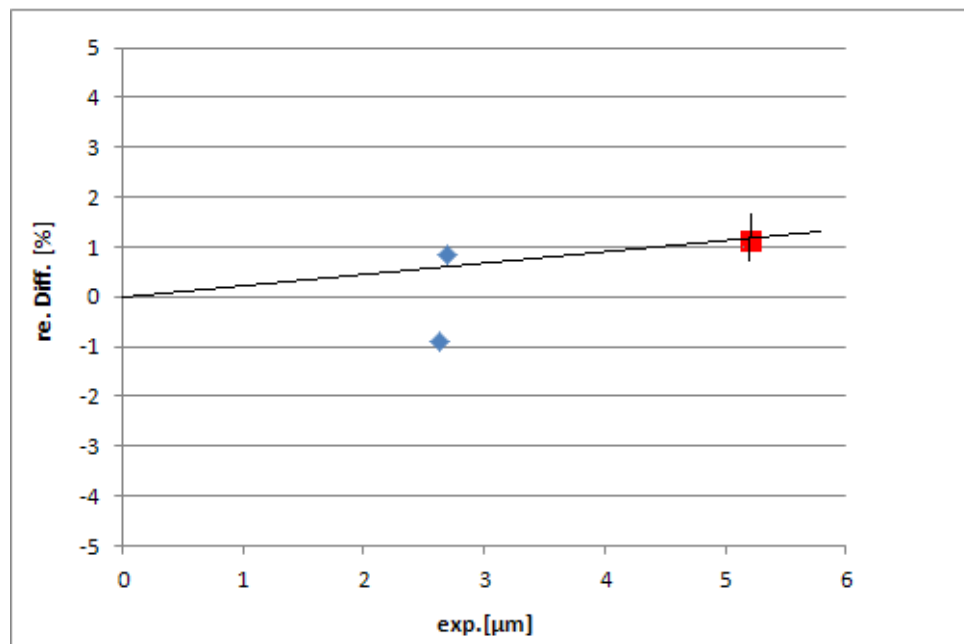


Fig. 1 Relative deviations of the standard free experimental reading with respect to the stated values. The red mark denotes the new primary standard whereas the blue ones refer to the old secondary standards which are corrected (calibrated) now, cf. Tab. 1.

Conclusion

The new foil is in good agreement with the previously evaluated data. Only weak corrections (1%) are calculated from a re-calibration using the new primary standard (Tab. 1). The other standards (Tab. 2 and 3) are calibrated in the same manner.

These standards are regarded as secondary standards now due to their direct relation with the BAS PT 5 16 09 11 standard.

The Pt foils of Tabs 1-2 form the GN set ser. No. 19816 (Prüfmittel 360/0381).

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06.08.2012

References

/1/ Reg. No. D-K-15076-01-00.