SELECTED PARTS OF A HYPOTHETICAL PAPER FOR THE INTERNATIONAL JOURNAL OF THERMOPHYSICS

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Radiance Temperatures at 1500 nm of Niobium and Molybdenum at their Melting Points[1]

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[1] Paper presented at the Sixteenth Symposium on Thermophysical Properties, July 30 – August 4, 2006, Boulder, Colorado, U.S.A.

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ABSTRACT

Radiance temperatures at 1500 nm of niobium and molybdenum at their melting points were measured by a pulse-heating technique. The method is based on resistively self-heating of a strip-shaped specimen up to melting in less than one second by a high-current pulse. During heating, radiance temperature is measured by means of a high-speed infrared pyrometer with a sampling time of 0.5 ms. When the specimen is melting, a nearly horizontal plateau in the radiance temperature versus time function develops. Radiance temperature for a given specimen is determined by avaraging the measured values along the plateau. The standard deviation of individual values from the mean is 0.1-0.3 K. 12 to 13 experiments were performed for each element under investigation. The results for radiance temperatures at 1500 nm are as follows: 1983 K for niobium and 2050 K for molybdenum. The expanded uncertainties arising from pyrometry and specimen conditions are ±8 K.

In alphabetical order:

KEY WORDS: emissivity; high temperatures; melting; molybdenum; niobium.

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1. INTRODUCTION

Melting-point radiance temperatures of selected pure metals have been suggested as basis of high temperature references for secondary calibrations of optical pyrometers [1]. Such calibrations require an accurate knowledge of wavelength dependence of radiance temperatures of the employed metals. In the past two decades, extended measurements in the wavelength range 500 to 1000 nm have been made at the National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, U.S.A. and the Istituto di Metrologia ’G. Colonetti’, Torino, Italy.

2. MEASUREMENTS

2.1. Specimens

2.2. Procedure

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3. RESULTS

The radiance temperature of niobium at the melting point of 13 melting plateaus and other pertinent results are presented in Table I.

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ACKNOWLEDGMENTS

This work was supported in part by the Microgravity Science and Applications Division of NASA. One of the authors (A. B. A.) gratefully acknowledges the award of a fellowship (Erwin-Schrödinger-Auslandsstipendium) from the Fonds zu Förderung der wissenschaftlichen Forschung, Austria.

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2. A. Cezairliyan, M. S. Morse, H. A. Berman, and C. W. Beckett, *J. Res. Natl. Bur. Stand. (U. S.)* **74A**:65 (1970).
3. H. Preston-Thomas, *Metrologia* **27**:3 (1990).

Each table on a separate page (insert after references):

Table I. Summary of Measurements of the Radiance Temperature at 1500 nm of Nb and Mo at Their Respective Melting Points

Experiment No.	Number of temperatures[a]	Radiance temperature at melting[b] (K)	SD[c] (K)
		Nb	
1	100	1983.3	0.1
2	250	1983.3	0.3
3	250	1983.3	0.2
4	250	1983.3	0.2
		Mo	
1	200	2524.7	0.2
2	200	2524.4	0.2
12	120	2524.4	0.2

[a]Number of temperatures used in averaging the results at the plateau to yield an average for the radiance temperature at the melting point of the specimen.
[b]The average value (for an experiment) of measured radiance temperature at the plateau.
[c]Standard deviation of the measured temperatures from the average value of the plateau in an individual experiment.

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Figure Captions

Fig. 1. Functional diagram of the high-speed measurement system.

Fig. 2. Radiance temperature as a function of time at a wavelengt of 1500 nm in the vincinity of the melting point.

Fig. 3. Comparison (on ITS-90) of literature values and present results for normal spectral emissivity of niobium and molybdenum at their melting points.

Each figure on a separate sheet, preferably to cover the entire page (insert after figure captions).

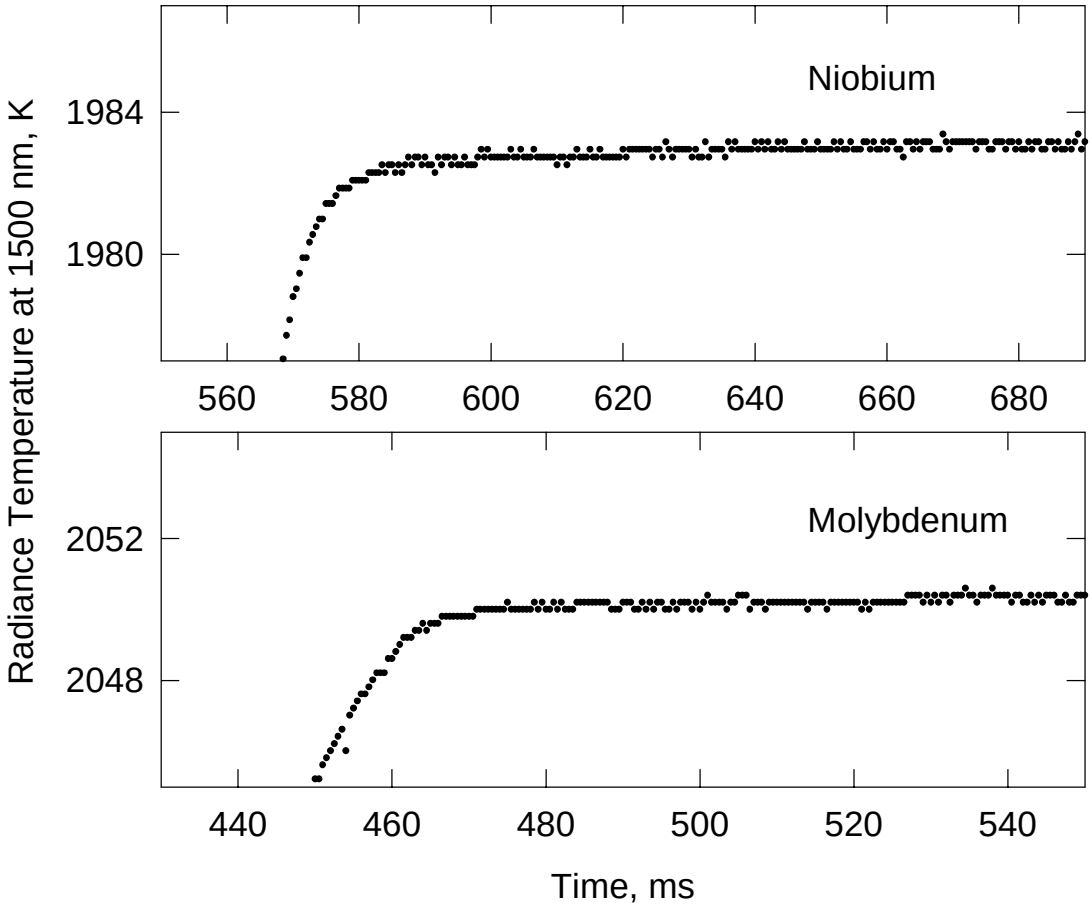
Niobium
Molybdenum
Radiance Temperature at 1500 nm, K
1984
1980
2052
2048
560
580
600
620
640
660
680
440
460
480
500
520
540
Time, ms

Fig. 2