

This article was downloaded by:

On: 28 January 2011

Access details: *Access Details: Free Access*

Publisher *Taylor & Francis*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Physics and Chemistry of Liquids

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713646857>

Study on the Solidification Process of Hg₁l Amalgam at 30 at.% T

Melania Bosco Masera^a

^a Dipartimento di Fisica, del Politecnico di Torino, Torino, Italy

To cite this Article Masera, Melania Bosco(2000) 'Study on the Solidification Process of Hg₁l Amalgam at 30 at.% T', *Physics and Chemistry of Liquids*, 38: 2, 233 — 236

To link to this Article: DOI: 10.1080/00319100008030272

URL: <http://dx.doi.org/10.1080/00319100008030272>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

STUDY ON THE SOLIDIFICATION PROCESS OF HgTl AMALGAM AT 30 at.% Tl

MELANIA BOSCO MASERA

*Dipartimento di Fisica del Politecnico di Torino,
Corso Duca degli Abruzzi, 24, 10129 Torino, Italy*

(Received 26 October 1998)

By means of a toroidal oscillating viscometer, logarithmic decrements of dampings have been measured in presence or absence of HgTl amalgam at 30 atomic percent thallium, at different temperatures, ranging from 12°C to 23°C.

Keywords: Phase diagram; viscometer damping

INTRODUCTION

In previous papers [1, 2] the HgTl amalgam was investigated at various atomic percentages. In paper [3] studies on the solidification process of HgTl amalgam at 28.2 at.% Tl were performed. In paper [4] evaluation of viscosity of the melting point of HgTl amalgam at 30 at.% Tl suggested experiments on the solidification process.

In the present study we focused on the logarithmic decrements of a viscometer dampings in the presence or absence of this amalgam, at different temperatures, from 12°C to 23°C.

EXPERIMENTAL APPARATUS

The toroidal oscillating viscometer used in the present investigation was the same as previously employed [1, 2].

EXPERIMENTAL RESULTS

The viscometer dampings in presence or absence (δ and δ_0 , respectively) of the HgTl amalgam at 30 at.% Tl have been measured at different temperatures, ranging from 12°C to 23°C. For the dampings obtained in the temperature range from 12°C to 23°C the viscosity η has been calculated using formula (1), as reported in Refs. [1, 2].

$$\frac{I\sqrt{2}}{4\pi^3 a^2 R^3 \rho} [(1 + T^2/T_0^2)\delta - 2T\delta_0/T_0] = g_1(q) - \delta g_2(q) + a^2 g_3/R^2(q) \quad (1)$$

The experimental results are presented in Ref. [4].

DISCUSSION OF EXPERIMENTAL RESULTS

The solidification process of HgTl amalgam at 30 at.% Tl occurs gradually, as the temperature-dependent δ variations shown in Figure 1.

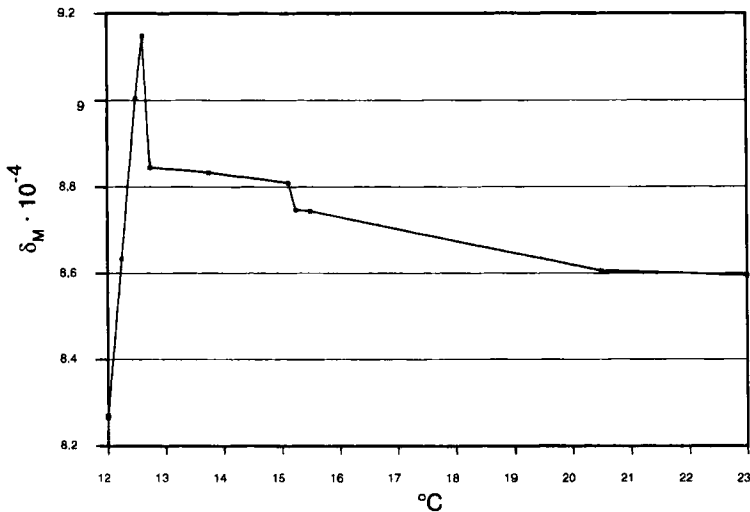


FIGURE 1 Logarithmic decrements of dampings of the viscometer containing the HgTl amalgam 30 a.t.% Tl versus temperature (from 12°C to 23°C).

At the temperature of 15, 25°C we obtained $\delta = 8,7485 \cdot 10^{-4}$ and $\delta_0 = 3,27226 \cdot 10^{-4}$ (Ref. [4]). We may conclude that at this temperature the amalgam is completely solid.

These results are in accord to theoretical values obtained from Ref. [3]. In fact, from Ref. [3]

$$\delta = \frac{\delta_0 I_0 T}{IT_0}; \quad T = \frac{\pi T_0 I}{\sqrt{I_0 [I(\pi^2 + \delta_0^2 T_0)] - \delta_0 I_0}} \quad (2)$$

where I_0 = the total moment of inertia of the system without the amalgam; $I = I_0 + 2\pi^2 R^3 a^2 [1 + 3/4(a^2/R^2)]$; a , R and ρ have the same values as in Ref. [1]; T and T_0 are the period of the system with and without the amalgam, respectively (Ref. [4]).

Introducing experimental values obtained at the temperature of 15,25°C in formula (2), it derives:

$$\delta = 3,266830 \cdot 10^{-4}$$

The differences between experimental and theoretical values of δ at the above temperature is

$$\Delta_\delta = 5,5 \cdot 10^{-4}$$

For the temperature of 15,50°C we obtained

$$\Delta_\delta = 5,5 \cdot 10^{-4}$$

For the temperature of 20,50°C we obtained

$$\Delta_\delta = 5,3 \cdot 10^{-4}$$

For the temperature of 23°C we obtained

$$\Delta_\delta = 5,2 \cdot 10^{-4}$$

It follows that for temperature values higher than 23°C, $\delta = 3,364275 \cdot 10^{-4}$ and the amalgam is completely solid.

SUMMARY

The logarithmic decrements of the dampings of an oscillating viscometer in presence or absence (δ and δ_0 , respectively) of the HgTI

amalgam at 30 at.% Tl has been measured at different temperatures, ranging from 12°C to 23°C. It has been found that the HgTl amalgam at 30 at.% Tl is completely solid at the temperature of 15,25°C with $\delta = 8,7485 \cdot 10^{-4}$ and $\delta_0 = 3,27226 \cdot 10^{-4}$. Furthermore, for temperature values higher than 23°C $\delta = 3,364275 \cdot 10^{-4}$, and the amalgam remains definitively solid.

References

- [1] Bosco Masera, M. (1980). Viscosity of HgTl amalgam, *Phys. Chem. Liq.*, **9**, 219–228.
- [2] Bosco Masera, M. (1984). Viscosity of Hg₅Tl₂ at 14,5°C, *Phys. Chem. Liq.*, **14**, 95–106.
- [3] Bosco Masera, M. (1989). Study on the solidification process of HgTl amalgam at 28,2 at.% Tl, *Phys. Chem. Liq.*, **19**, 145–149.
- [4] Bosco Masera, M. (1980). Viscosity of the melting point of Hg–Tl amalgam at 30 at. percent Tl, *Phys. Chem. Liq.*, **10**, 121–126.