CONSTRUCTION AND PROFILE TEMPERATURE OF QUARTZ DROP TUBE

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1. Introduction

Microgravity research has great significance to understand weightlessness interaction in materials processing. Drop tube is a technique to reproduce reduced gravity in containerless solidification of metals and alloys during free fall with quick cooling (few seconds) [1].

2. Objectives

In order to study the formation of droplets during free fall and their initial velocity, as well as temperature profile along z-axis tube, a transparent drop tube dedicated to film record the falls with high-speed images (Fig. 1a) was developed [2].

3. Experimental Results and Discussions

The drop tube has two thermocouples: Ts, inside the sample ampoule to verify sample temperature and Tc, connected to the furnace temperature controller. The drop tube interior was filled with nitrogen gas with four different pressures, 0.25atm, 0.50atm, 0.75atm and 1.00atm. The initial set controller temperature was 100°C. The drop tube profile along the z-axis was measured each 20s with the Ts thermocouple (Fig. 1b).

4. Results and Discussions

Figure 2 shows the profile temperature along the drop tube z-axis. It was verified that the environment pressure has important significance in droplets formation.

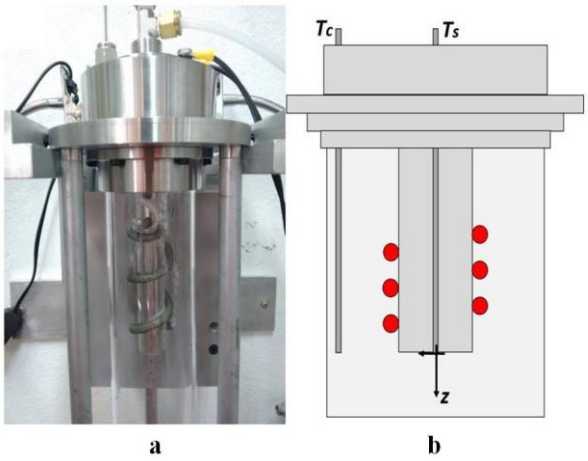

Fig. 1.a. *Constructed drop tube.* **1.b.** *Schematic representation of furnace drop tube showing z-axis origin, position of thermocouples Ts and Tc.*

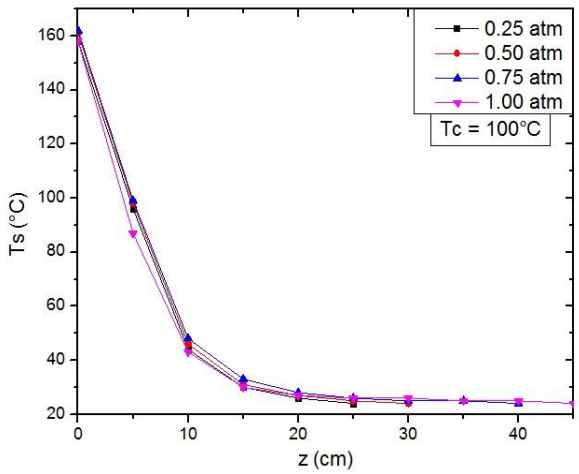

Fig. 2. *Profile temperature (Ts) for nitrogen gas environment under pressures equals to 0.25, 0.50, 0.75 and 1.00 atm.*

5. References

[1]- R. J. Naumann and H. W. Herring, *"Materials processing in space: early experiments"*, NASA, (1980).

[2]- E. F. Fumachi, *et al*, *Proposal of drop tube construction to optimize experimental parameters*. In: CONGRESSO BRASILEIRO DE APLICAÇÕES DE VÁCUO NA INDUSTRIA E NA CIÊNCIA, 36. (CBRAVIC), Vitória, ES. Proceedings... 2015. p. 93.

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