PROPOSAL OF DROP TUBE CONSTRUCTION TO OPTIMIZE EXPERIMENTAL PARAMETERS

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1. Introduction

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

2. Objectives

Filming and studying the heat transfer of the samples during free fall to optimize the working conditions of the drop tube like pressure, initial velocity of samples, samples weight and quality.

3. Experimental

In order to study the formation of droplets during free fall and their initial velocity, as well as shooting pressure relations, a drop tube dedicated to film record the falls with high-speed images (Fig. 1a - 1c) will be developed.

The apparatus consists of a tube furnace similar to that of the conventional drop tube [2], with quartz walls. The lower end is maintained transparent to permit the filming. A temperature controller provides temperatures up to 600 ^{o}C. For shooting at high speed a Photron camera FastCAM 1024PCI 100Kc with COMICAR / PENTEX lens and a set of illumination lamps (Fig. 2) was used, with software for PC image acquisition.

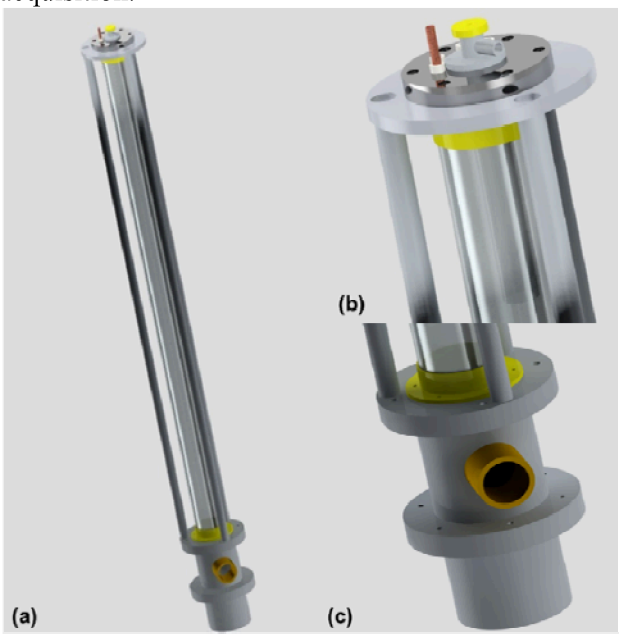

Fig. 1. (a) *Rendered image of drop tube proposed in this work;* **(b)** *details of drop tube top* **(c)** *details of drop tube bottom.*

Fig. 2. *Prototype drop tube developed in LAS/INPE dedicated to record.*

4. Conclusion

The prototype drop tube shows that is possible to optimize the conventional drop tube parameters to obtain higher quality droplets.

5. References

[1]- R. J. Naumann and H. W. Herring, *"Materials processing in space: early experiments"*, NASA, (1980).
[2]- R. C. Toledo, *et al*, Microgravity Science and Technology, **26**, 119-124, (2014).

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