A Prototype of a Standard Spreadability Tester for Additive Manufacturing

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ABSTRACT

We describe a simple device called the Standard Spreadability Tester (SST). The idea behind the SST is that instead of trying to predict how a powder will spread using the powder's intrinsic properties (e.g., particle size distribution (PSD), morphology, surface, and chemical makeup) or how it performs under some other stress conditions, we subject the powder directly to conditions of stress very similar to what it sees in a Powder Bed Fusion (PBF) machine. In brief, the SST provides a test method that is straightforward and can be run in a laboratory or commercial setting. In this work, we have described the design of the device and proved the concept by preliminary testing. The remaining potential improvements have been also discussed.

1 INTRODUCTION

Metal powders are commonly used as feedstocks in additive manufacturing (AM) processes. Both the intrinsic properties and the in-process performance of the powder play a significant role in determining the final part properties [1-3]. Powder bed fusion (PBF), one of the more common process categories in AM technologies, employs a powder deposition mechanism, often utilizing a recoater blade, to create thin layers of powder. Using various algorithms, three-dimensional part designs are sliced into layers each consisting of two-dimensional profiles. Each layer is selectively irradiated and melted by a heat source (commonly a laser or electron beam) and is solidified. Repeating this process layer after layer results in nearly 100 % dense solid parts.