

Laura Cordova, Ton Bor, Marc de Smit, Mónica Campos, Tiedo Tinga,

Measuring the spreadability of pre-treated and moisturized powders for laser powder bed fusion,

Additive Manufacturing,

Volume 32,

2020,

101082,

ISSN 2214-8604,

<https://doi.org/10.1016/j.addma.2020.101082>.

(<https://www.sciencedirect.com/science/article/pii/S2214860419304397>)

#### Abstract

For AM processes—specifically Laser Powder Bed Fusion (L-PBF) processes—powder flowability is essential for the product quality, as these processes are based on a thin layer spreading mechanism. However, the available techniques to measure this flowability do not accurately represent the spreading mechanism. Hence, this paper presents two novel applicator tools specifically designed to test the spreadability of L-PBF powders in thin layer application. The results were checked by running standard tests to analyze the powder morphology, moisture content, chemical composition and flowability using the Hall-flowmeter. For this study, four common L-PBF metal powders were selected: Inconel 718, Ti6Al4V, AlSi10Mg and Scalmalloy. From the as-received state, drying (vacuum and air) and moisturizing treatments were applied to compare four humidity states and investigate the feasibility of pre-treating the powders to remove moisture, which is known to cause problems with flowability, porosity formation and enhanced oxidation. The tests reveal that AlSi10Mg is the most susceptible alloy to moisture and oxygen pick-up, considerably decreasing the spreadability and relative density on the build platform. However, the results also reveal how challenging the direct measurement of moisture levels in metal powders is.