

Title:

A Study of the Feasibility of Using Clean Nitrogen Gas for Metal 3D Printing Applications

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Abstract:

Generating nitrogen on-site for cold spray applications is highly appealing due to its sustainable benefits. These benefits include the reduction of the environmental impacts of traditional nitrogen production, cost effectiveness, and reliability. This work has compared the use of bottled nitrogen and on-site generated nitrogen for use in cold spray additive manufacturing and their respective effects on cold spray properties. It is critical to understand any discrepancies between the cold spray results using bottled and generated nitrogen, why they exist, and how to overcome them. Two metal powders were examined, chromium and commercially pure (CP) nickel, each sprayed with bottled nitrogen and generated nitrogen. To examine these differences, the metal powders and sprayed specimens were characterized using ONH element analysis, nanoindentation, particle compression, microscopy, profilometry-based indentation plastometry (PIP), and micro-indentation.