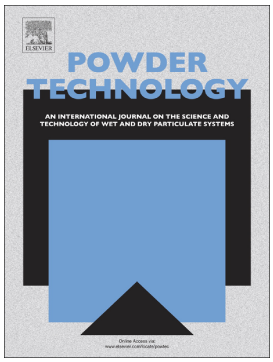

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Amir Mostafaei, Colleen Hilla, Erica L. Stevens, Peeyush Nandwana, Amy M. Elliott, Markus Chmielus

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Comparison of characterization methods for differently atomized nickel-based alloy 625 powders

Amir Mostafaei [a], Colleen Hilla [a], Erica L. Stevens [a], Peeyush Nandwana [b,c], Amy M. Elliott [c,d], Markus Chmielus *, [a]

[a] Department of Mechanical Engineering and Materials Science, University of Pittsburgh, Pittsburgh, PA 15261, USA
[b] Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA
[c] Manufacturing Demonstration Facility, Oak Ridge National Laboratory, Oak Ridge, TN, USA
[d] Energy and Transportation Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA

* Corresponding author
Email addresses: amir.mostafaei@pitt.edu (A. Mostafaei), chmielus@pitt.edu (M. Chmielus)

Abstract

The deployment of additive manufacturing depends on the quality of the produced part, specifically the absence of internal defects, impurities and compositional gradient. In this study, differently atomized nickel-based alloy 625 powder particles were systematically characterized with different methods and results were compared. Powder properties were studied to understand the effect of different atomization methods on the properties of the powder particles. Morphology, shape and size of water and argon atomized powders were observed using optical microscopy, scanning electron microscopy and micro-computed X-ray tomography (μCT); μCT with different resolution and sample setup. As expected, water atomized powder particles have irregular morphology in contrast to spherical shaped gas atomized particles. Phase and elemental analysis were conducted with X-ray diffraction and energy dispersive spectroscopy; thermal properties were measured with differential scanning calorimetry. Gas atomized powder shows composition and melting temperature close to nominal bulk alloy 625. Particle size analysis was carried out using sieving, laser particle size analysis and μCT. It is found that the average particle size