

Production of Metal Powder Using Twin Arc Spraying Process for Additive Manufacturing

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Abstract : Additive Manufacturing (AM) provides promising opportunities to optimize and to produce tooling by integrating near-contour tempering channels for more efficient cooling. To enhance the properties of the produced tooling using additive manufacturing, prototypes should be produced in short periods. Thereby, this requires a small amount of tailored powders, which either has a high production cost or is commercially unavailable. Hence, in this study, an arc spray atomization approach to produce a tailored metal powder at a lower cost and even in small quantities, in comparison to the conventional powder production methods, was proposed. This approach involves converting commercially available metal wire into powder by modifying the wire arc spraying process. The influences of spray medium and gas pressure on the powder properties were investigated. As a result, particles with smooth surface and lower porosity were obtained, when nonoxidizing gases are used for thermal spraying. The particle size decreased with increasing of the gas pressure, and the particles sizes are in the range from 10 to 70 μm , which is desirable for selective laser melting (SLM). A comparison of microstructure and mechanical behavior of SLM generated parts using arc sprayed powders (alloy: X5CrNiCuNb 16-4) and commercial powder (alloy: X5CrNiCuNb 16-4) was also conducted.

Keywords : additive manufacturing, arc spraying, powder production, selective laser melting

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