# Atomised powders of high temperature structural materials for additive manufacturing

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Gas atomisation is the process where the liquid metal is disrupted by high-velocity gas and atomisation occurs by kinetic energy transfer from the gas to the metal. Argon atomised powders have been developed for high performance alloys to meet the requirements of additive manufacturing. Advances in the argon atomisation technologies of two types of high temperature structural materials, nickel based superalloys and titanium aluminides, are evaluated in this paper. The equipment, process and research results of argon atomization technology at BIAM will be presented. BIAM initiated the research and development of gas atomisation and deposition for superalloys, intermetallics and special steels in early 1990s. A serial gas atomisation and deposition plants with melt capacity of 50 to 350 kilograms have been designed, established and modified. Typical superalloys were vacuum induction melt, gas atomised, consolidated, and hot processed. Simulation and modification of the atomisation process were investigated to optimise the melting and atomising parameters to make designed and clean powders for manufacturing sound components. The results exhibit that the clean, spherical powders, with high yield and low oxygen contents, can be achieved after the optimisation of melting and atomising parameters. Argon atomised powders of Ni and TiAl based alloys with a range of particle size, oxygen contents, chemistry are utilised to produce components by additive manufacturing techniques. The metallurgical quality and mechanical properties of components produced by additive manufacturing are shown to be closely related to powder quality and character such as purity, morphology, particle size, and sphericity.