

# **New AM Alloys and Metallurgical Issues for Selective Laser Melting(SLM)**

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This presentation highlights the SLM research activities in Monash Centre for Additive Manufacturing, in particular on process optimisation and post heat treatment development in order to achieve required mechanical properties for Ti, Ni and Al alloys. Different materials have different issues in the SLM process, due to their metallurgical and crystallographic differences. Whilst elimination of cracking and retaining high temperature properties and stability are critical for SLM Ni alloys, optimisation of post heat treatment becomes more significant for Al alloys as defined by the nature of the sensitive response of precipitates of Al alloys during heat treatment. The optimum post heat treatment of SLM'd Ti64 has found to be totally associated with the completion of martensitic transformation where ductility of 18% and yield strength of > 900MPa can be easily achieved. Extensive study has been carried out in understanding the evolution of microstructure during solidification and post heat treatment and their influence on tensile and fatigue properties. The development of a new high strength and high temperature Al alloy for SLM will also be presented, in particular its design philosophy and its outstanding properties.