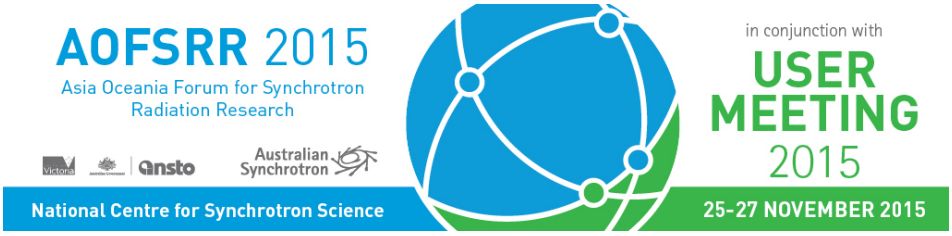

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Synchrotron X-ray Tomographic characterisation of titanium parts fabricated by additive manufacturing

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Additive manufacturing technologies are applicable to a wide range of materials (polymers, ceramics, metals) and provide unprecedented design freedom and rapid prototyping opportunities. Synchrotron X-ray tomography (SXRT) has been applied to the study of titanium parts fabricated by additive manufacturing (AM). The AM method employed here was the Arcam EBM® (electron beam melting) process which uses powdered titanium alloy, Ti64 (Ti alloy with approximately 6%Al and 6%V) as the feed and an electron beam for the sintering/welding. The experiment was conducted on the Imaging and Medical Beamline (IMBL) of the Australian Synchrotron. The samples considered here represent a selection of simple and complex shapes with a variety of internal morphologies. They were chosen to investigate (i) the effect of build direction and complexity of design on the surface morphology and final dimensions of the pieces and (ii) the location and nature of any defects within the pieces. Such information combined with detailed knowledge of the process conditions can contribute to understanding the interplay between design and manufacturing strategy. This fundamental knowledge may subsequently be incorporated into process modelling, prediction of properties and the development of robust build protocols for the production of defect free parts.

Keywords

Additive manufacturing; tomography; titanium

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