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Neutron measurements for Additively Manufactured components

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Additive manufacturing is an exciting new approach to produce components that are not manufacturable using traditional methods. Coupled with its short CAD-to-product time, this method had been gaining significant attention. In particular, the application of Selected Laser Melting, which can process metals, is gaining popularity in application on aerospace components. Due to the numerous rapid thermal cycling in the melting process, strong residual stresses develop within the component being built, which leads to deformation and cracking. Neutron diffraction has sufficient penetration and measurement resolution to map the residual stresses variations within the component. Furthermore, the dimensional accuracy of the produced components is particularly difficult to measure due to the complex geometry. For example, the application of topology optimisation for weight reduction leads to a more organic shape as well as internal cavities but the component becomes more sensitive to geometric variations. Neutron CT is able to capture the geometry, particularly of internal cavities, as well as possible defects present. The combination of these two neutron measurement techniques provide a strong basis for improving the understanding of the SLM process and aid in the maturing of this process towards serial production.

Topic

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