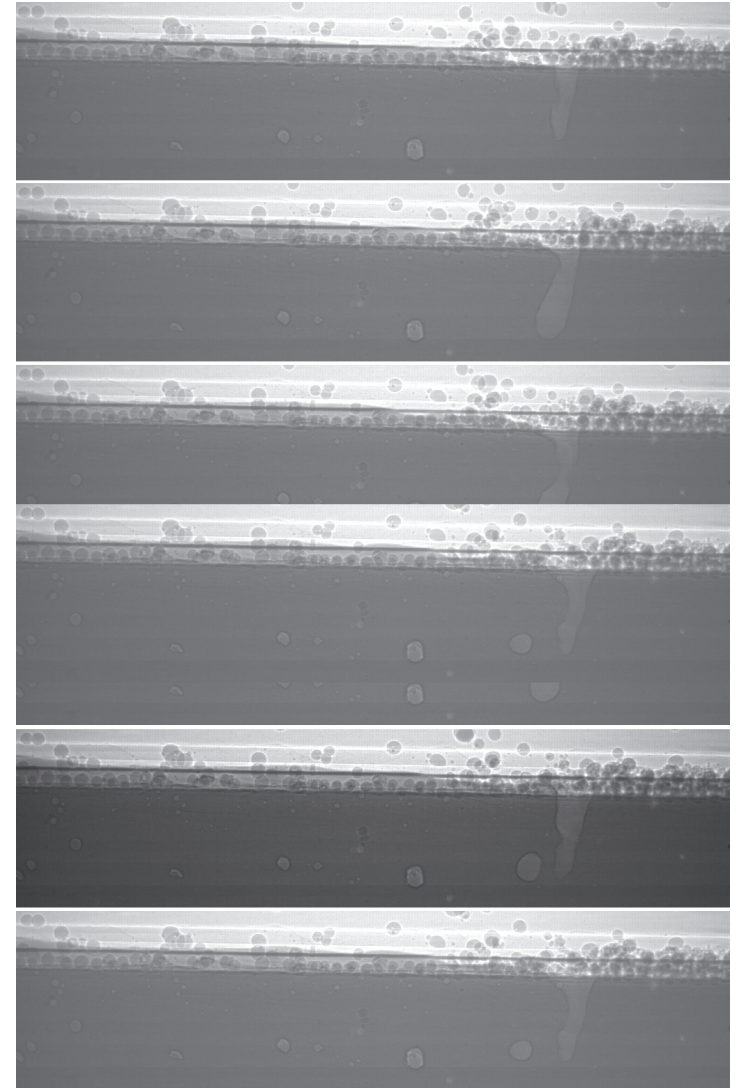


A.D. (Tony) Rollett

3-D Characterization of Additively Manufactured Metals

Additive manufacturing is a relatively new technology that has given rise to the “maker culture” and an intense interest in design. That has carried over into metals additive, which has jumped almost immediately into manufacturing of actual parts in a variety of alloys. In doing so it has liberated thinking about part design albeit within certain constraints, and complex components have been deployed that would previously have required complex machining and assembly. Not everything is as simple as it seems, however, and reliability of parts that must carry load depends on the internal (micro-) structure, especially alternating stress. This motivates a detailed study of all aspects of materials microstructure ranging from porosity to strain, all of which is ideally suited to the use of intense sources of high-energy x-rays as only third-generation light sources can deliver. Computed tomography (CT) has revealed the presence of porosity in all additively manufactured metals examined to date and confirmed that appropriate process control can limit it. CT has also revealed an unfortunate tendency of pores to re-grow even after they have been “healed” by hot isostatic pressing. High-speed radiography has revealed even more crucial details of how laser light generates melt pools that sometimes trail voids behind them. For the first time, solidification cracking has been caught “in flagrante delicto” which offers the possibility finding recipes for alloys previously considered off-limits to 3-D printing.



A.D. (Tony) Rollett has been a Professor of Materials Science & Engineering at Carnegie Mellon University (CMU) since 1995 and was the Department Head 1995-2000. Prior to CMU he worked for the University of California at the Los Alamos National Laboratory (1979-2005). He spent 10 years in management with five years as a Group Leader and then Deputy Division Director at Los Alamos, followed by five years as Department Head at CMU (1995-2000). He has published about 200 peer reviewed papers on a wide variety of topics in materials science, many of which are cited frequently in the literature. The main focus of his research is on additive manufacturing and the measurement and computational prediction of microstructural evolution, especially in three dimensions. His interests include additive manufacturing, strength of materials, constitutive relations, microstructure in 3-D, texture, anisotropy, grain growth, recrystallization, formability, and stereology.

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