SAND2014-2297P

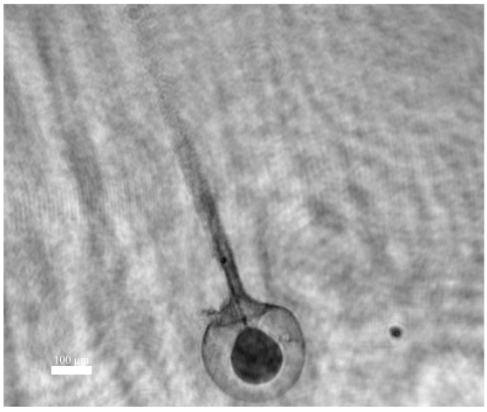
Title:

Digital in-line holography (DIH) for 3D measurement of aluminum drop combustion in propellant fires

Abstract:

Digital in-line holography (DIH) is a laser based technique in which recorded 2D images are numerically refocused to reconstruct the depth direction. This talk will summarize progress in DIH completed through a unique partnership between Sandia National Laboratories and Purdue University (Prof. Jun Chen and doctoral candidate Jian Gao). Following a brief introduction to the technique, we will discuss the development and validation of methods to automatically extract 3D particulate locations and morphology from refocused images. Applications to liquid fragmentation and high-speed particulate flows demonstrate our ability to measure particle sizes, 3D positions, and 3C velocity within complex environments. Finally, the talk will discuss recent application of DIH for visualization and quantification of aluminum drop combustion in propellant fires. This data result in what is believed to be the highest fidelity images yet recorded of this challenging combustion environment while simultaneously overcoming depth-of-focus limitations of traditional microscopy and enabling quantitative measurement of all drops within the line-of-sight.

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract No. DE-AC04-94AL85000.



DIH image of a burning aluminum drop in a propellant fire

Bio:

Daniel R. Guildenbecher is a Senior Member of the Technical Staff at Sandia National Laboratories in Albuquerque, New Mexico. Dr. Guildenbecher's research emphasizes experimental diagnostics of multiphase flows, particularly those involving particle transport, liquid fragmentation, combustion, and energy conversions. Dr. Guildenbecher received his Ph.D. in Mechanical Engineering from Purdue University in 2009. Prior to joining Sandia, Dr. Guildenbecher was a Visiting Professor at the Karlsruhe Institute of Technology (2009-2010) and Purdue University (2010-2011).