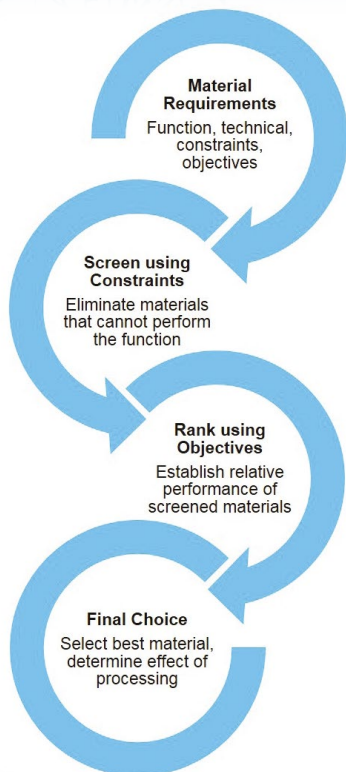


## THOUGHT LEADERSHIP ARTICLE UTILIZING TECHNOLOGY FOR RATIONAL MATERIALS SELECTION

Material selection is a complex area that is influenced by a number of factors, including functionality and performance, which ultimately relate back to whether a material can withstand its intended environmental stresses.

The methodologies used to select materials are ever-changing and starting to be greatly influenced by technology. Our recent thought leadership article discusses the latest areas of technology that are changing the way we can analyse material properties and the techniques that can impact material selection processes.

Download the free article at  
[www.lucideon.com/aero-leadership](http://www.lucideon.com/aero-leadership)



## NEW AEROSPACE BUSINESS MANAGER



**We're delighted to announce that Dan Cunningham has been promoted to business manager for aerospace.**

Based at the Research Triangle Park in North Carolina, USA, Dan previously held the role of technical sales for aerospace at Lucideon. During this role, Dan was the commercial lead for aerospace, defense and additive manufacturing (AM) in the USA.

Dan has a BS in Aerospace Engineering and an MS in Engineering Mechanics, both from Pennsylvania State University, and a background in the development of carbide and ceramic materials for industrial wear components and surface coatings.

As the business manager for aerospace, Dan is now responsible for overseeing the global aerospace business and driving growth through partnerships with key companies to support the development, implementation and troubleshooting of new materials to address their most challenging needs.

### Contact Dan

T: +1-919-504-2000

M: +1-814-933-2897

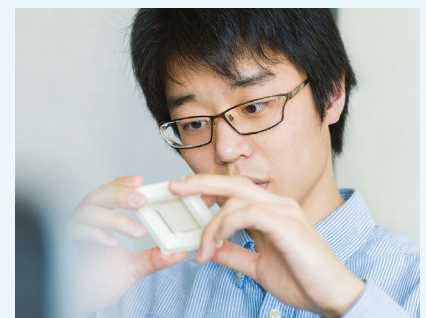
[dan.cunningham@lucideon.com](mailto:dan.cunningham@lucideon.com)

## NEW CERAMIC ADDITIVE MANUFACTURING FACILITIES

Lucideon has seen and conquered ceramics challenges when every new technology has come into play, from casting to extrusion to injection molding - and ceramic additive manufacturing (AM) is no different. We have appointed a team of ceramics experts to drive forward the advancement of ceramic AM through optimization of feedstock materials, benchmarking and development of printing systems and qualification of end use components.

We have internal ceramic AM printing capabilities across fusion deposition modeling (FDM) and stereolithography, and expect binder jetting to come online in mid-2019. Our extensive expertise and capabilities enable us to support feedstock development as well as debinding and sintering optimization. These

capabilities enable Lucideon to provide vital assistance to companies developing the first wave of products utilizing this new technology. Much like we have seen in recent years with metal AM, interest in this technology begins with specialized applications which truly leverage the strengths of the technology to obtain a performance gain which is unattainable through any other method.



MEET...  
**TRAVIS GUENTHER  
 AND TIM ABBOTT**



Travis is our product manager for aerospace and is responsible for identifying new opportunities for our customers, as well as ensuring that material and product challenges are solved quickly and effectively.

Prior to joining Lucideon, Travis was employed at a company that specialized in the maintenance repair and overhaul of gas turbine engines (turboprops and turbofans) for 9 years. He held several different positions during this time, including: production engineer, service engineer, project engineer and most recently production engineering manager.

Travis has a BS in Mechanical Engineering (Aerospace option) from the University of Manitoba in Winnipeg, Canada.

Contact details  
 T: +1-919-504-2400  
[travis.guenther@lucideon.com](mailto:travis.guenther@lucideon.com)



As business development manager for aerospace and energy at Lucideon, Tim drives the development of our European aerospace and nuclear businesses.

Tim has a background in global business development and management, and this, combined with his technology insight, enables him to understand the needs of our clients with regards to material challenges and new materials technologies.

With a BA in International Business, Tim has enjoyed a career working in high tech companies around the world.

Contact details  
 M: +44 (0)7800 570372  
[tim.abbott@lucideon.com](mailto:tim.abbott@lucideon.com)

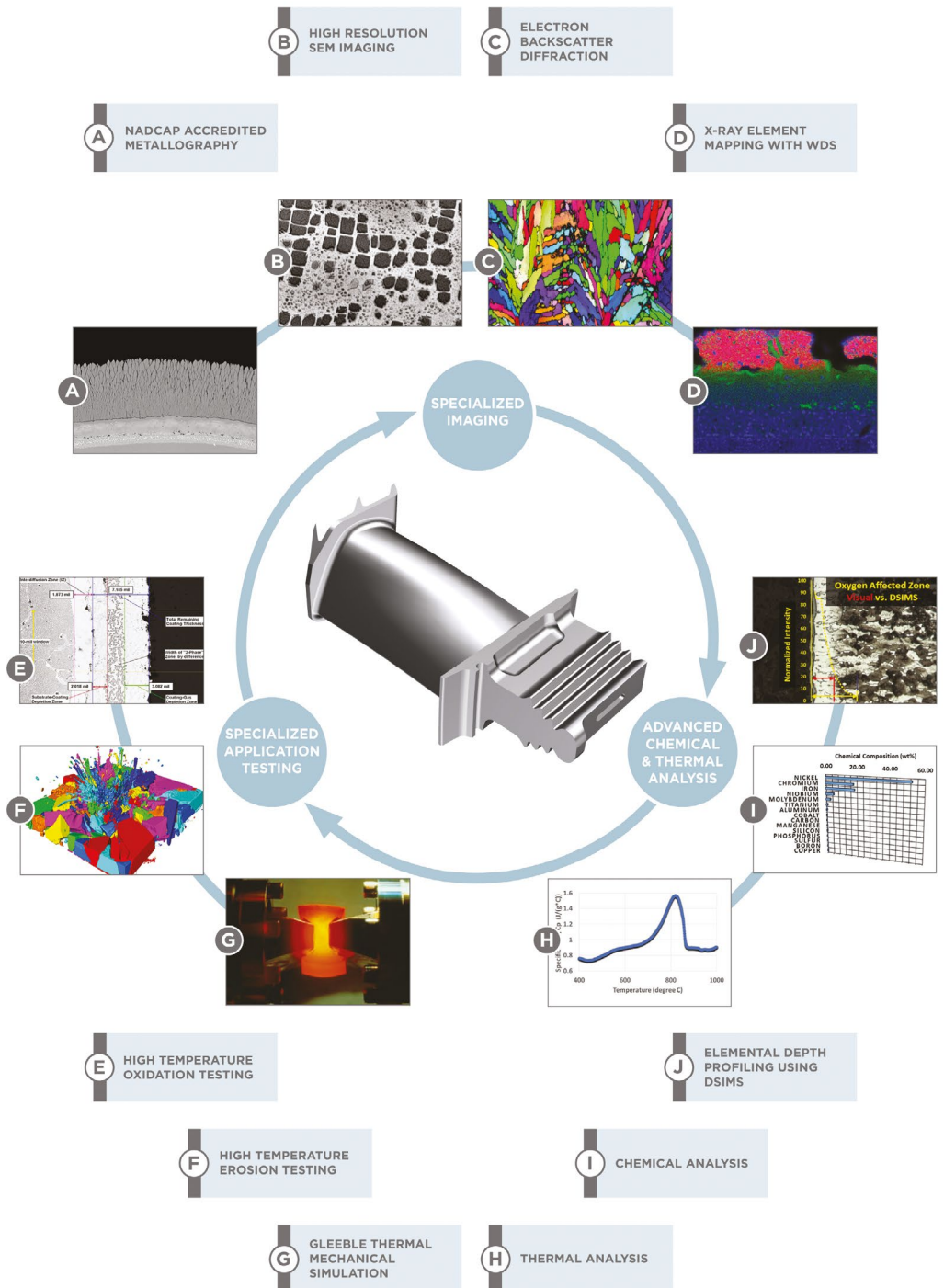
# TURBINE BLADE & COATING DEVELOPMENT SERVICES

At Lucideon, we work with a wide range of turbine blade and other hot gas path component manufacturers, to support the development and qualification of materials and technologies.

Did you know our expertise and experience goes beyond our testing capabilities? Whatever stage you are at in the lifecycle of your products, we can help. Our consultants can provide you with materials and process development and optimization, root cause investigation of failures and additive manufacturing (AM) support.

To find out about our services and techniques for turbine blade and coating development visit:

[www.lucideon.com/turbine-blades](http://www.lucideon.com/turbine-blades)



## CASE STUDY

# LUCIDEON'S SURFACE ANALYSIS PROVIDES KEY DATA FOR ROLLS-ROYCE

## The Challenge

Ni-base superalloys, grown from single crystals, have been developed to meet stringent demands in the hot sections of modern gas turbine engines. These turbine blades require a thermal barrier coating (TBC) to provide adequate insulation. The TBC comprises an yttria-stabilised zirconia (YSZ) top coat and a Pt-diffused bond coat which aids adhesion of the YSZ to the superalloy substrate. Sulphur, which is present at low ppm levels in the Ni-base alloy, is known to segregate during thermal cycling and may accelerate cavity formation with the potential to compromise long-term engine performance.

Lucideon was approached by Rolls-Royce to assess quantitative changes in sulphur concentration across the microstructure of a turbine blade material which had been subjected to a series of treatments, including high temperature ageing and oxidation cycles.

## What We Delivered

We utilised our Secondary Ion Mass Spectrometry (SIMS) expertise to develop a bespoke method to examine the in-depth distribution of sulphur and other key elements including Pt, Cr and Al, across the near-surface microstructure using cross-sectional imaging of the treated turbine blade materials. Retrospective linescans from the image data allowed quantitative comparison of the effects of treatments on sulphur segregation through the top coat / bond coat / substrate structure<sup>1</sup>.

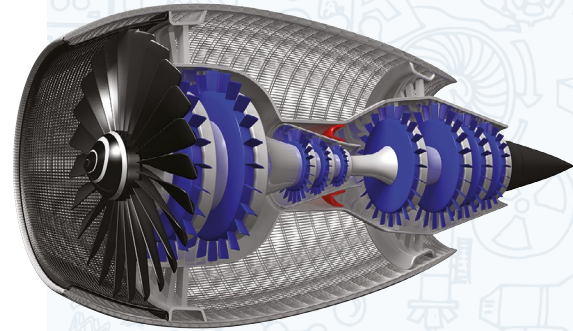
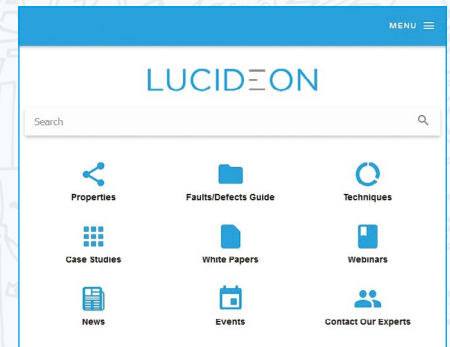
## Value to the Client

The SIMS method successfully monitored the in-depth distribution of key alloying elements and trace elements, i.e. sulphur, within Ni-base superalloys. The method clearly identified areas of sulphur partitioning within the structure and the effects of thermal cycling on this process. The study helped Rolls-Royce to increase its current understanding of sulphur's role in the failure mechanisms of TBC's along with the potential to investigate ways to reduce failures in the TBC structure.

### REFERENCE:

<sup>1</sup> N. D'Souza, F. Liu, S. Irwin, A. Brown, I.M. Edmonds & D.S. Rickerby; Oxid. Met. (2016) 85:369-389

## MATERIALS APP



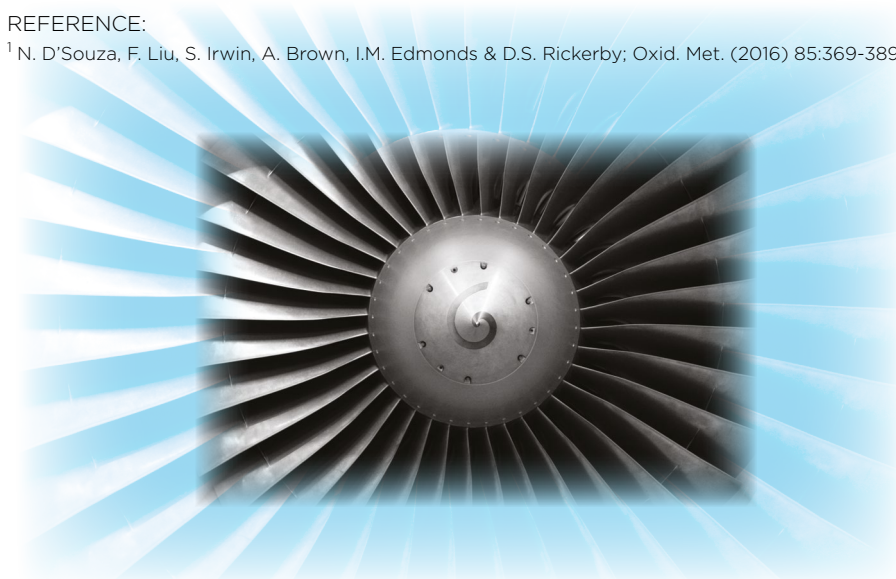
The new materials app is designed to provide key materials information at the touch of a button, helping clients find a route to solving their materials and processing challenges.

The app contains an extensive amount of information on a range of materials and their properties, faults and defects in ceramics, metals and surfaces, techniques used for analysis, white papers, webinars and case studies.

To access the app, visit

[www.materials-matter.com](http://www.materials-matter.com)

Please note that the website will need to be added as an icon on any mobile phone home screen.



[www.lucideon.com/aerospace](http://www.lucideon.com/aerospace)

Tel (US) +1-919-504-4900

Tel (UK) +44 (0)1782 764428

[inquiries@lucideon.com](mailto:inquiries@lucideon.com)