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Single Splat Formation in Atmospheric Plasma Spraying

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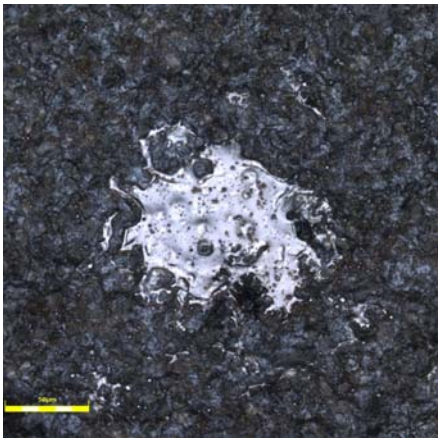
Abstract

Thermal and environmental barrier coatings (TBCs and EBCs) are essential for implementing a variety of components in the hot section of jet engines. These coatings are typically applied via atmospheric plasma spraying (APS), in which the desired coating material, typically in powder form, is melted and accelerated towards the substrate via a plasma torch in open air. Individual particles travel towards the substrate at high velocity after being melted, impact a usually roughened substrate surface, spread on the surface and solidify to create a splat. Coating properties, including adhesion, depend on splat formation and it is important to better understand what affects this formation. Both the generation of single splats and the observation of them on rough surfaces can be very challenging. Thus, utilizing simulation software to study these phenomena can be of great benefit, and there is a strong need for further study of the effect of a rough surface on splat behavior. The goal of this work is to understand the effects of surface topography on single splat formation and coating adhesion through simulation and experimental studies. This will ultimately inform the methods of preparing surfaces for plasma spray coating to optimize coating performance.



A silicon single splat on a rough silicon carbide surface generated via atmospheric plasma spraying

Biography

Austin Scherbarth is a PhD candidate in the MSE department. He received his bachelor's degree in Materials Science & Engineering from Purdue University in 2015 and started working in Dr. Pickrell's group in the fall of 2015. He expects to graduate in 2019. He works closely with Rolls-Royce on surface preparation and thermal spray coating of silicon carbide and silicon carbide ceramic matrix composites.