Bio-engineering Applications for Thermal Spray Coatings: Challenges and Opportunities

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Abstract:

Thermal spray coating technology has an extended history for various bio-engineering applications, ranging from antibiofouling, biocidal to orthopedic applications. These thermal spray coatings (TSCs) can be in direct contact with microorganisms, with or in the absence of physiological media and operate under mechanical loads.

In this presentation, we will summaries our collective experience over the past decade working on various bio-engineered TSC coatings that include traditional air plasma spray bioceramic coatings, novel cold sprayed biocomposite coatings, as well as solution precursor plasma spraying of transition metal-substituted biomedical coatings. We will highlight fundamental links between TSC coating’s roughness topology, microstructure, elemental composition, chemical phases with important potential properties of biocompatibility and/or antimicrobial.

Our studies have highlighted several knowledge gaps that raise critical scientific propositions. For example; manufacturing methods can create surface architectures that either promote or inhibit cellular growth. This fundamental understanding is driving our frontier research towards new applications that will employ thermal spray manufacturing. The challenges and risks are great; but so are the opportunities and rewards.

Acknowledgements: This work has been sponsored by the Australian Research Council under a joint effort by two Industrial Transformation Training Centers: Innovative Bioengineering (IC170100022) and Surface Engineering for Advanced Materials (IC180100005).

Presenter Bio:

Distinguished Professor Chris Berndt joined Swinburne in early 2008 as the founding Professor of Surface Science and Interface Engineering. This followed his role as founding Professor of Surface and Interface Engineering at James Cook University, a tenured professor position at Stony Brook University (where he remains Adjunct Professor) and appointments at the NASA-Lewis Research Center in Cleveland as a Fellow of the Institute for Aerospace Propulsion and Power where he worked on thermal barrier coatings.

Professor Berndt's professional responsibilities gravitate around the Thermal Spray Society of the ASM of which he has been a member since 1991. He was appointed as the Vice President of this society in 2000 and President in 2002. He was the Proceedings Editor for the Thermal Spray Conferences held in the USA from 1992-2003. He was inducted into the Thermal Spray Hall of Fame in 2007 and is editor/co-editor of 10 conference proceedings on thermal spray.
Professor Berndt is the Founding Editor, and now Editor Emeritus, for the Journal of Thermal Spray Technology. He is a member of some 13 professional societies in the materials, mechanical, manufacturing and biomedical fields and has more than 550 publications in the field of materials science and engineering. He is also a Fellow of the Australian Institution of Engineers, a Fellow of ASM International, a Fellow of The Institution of Metallurgists (UK), and of ASME, ACS and ACerS. He is also a Chartered Engineer (UK), a Professional Engineer (Australia), and a Member of the College of Bioengineers (Australia).