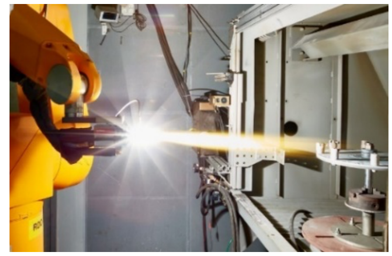
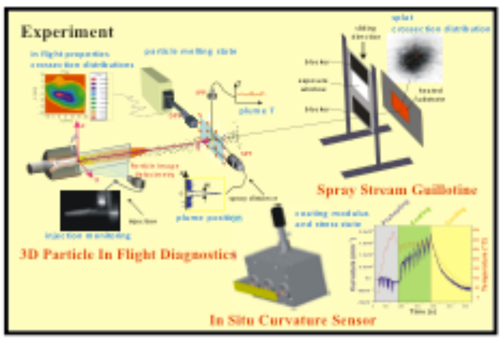
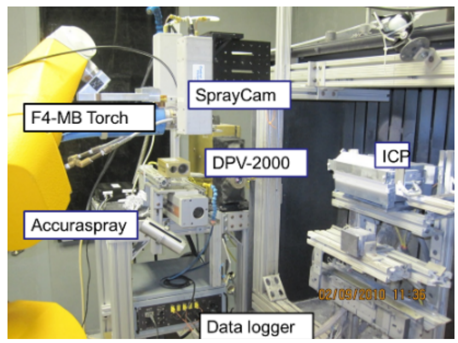
CENTER FOR THERMAL SPRAY RESEARCH COMPLETES SUCCESSFUL 25 YEARS

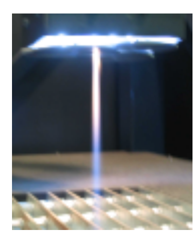


In August 1996, following a year long, multistage competition, the National Science Foundation awarded a team led by Stony Brook faculty, a multi-year Center grant under the auspices of the Division of Materials Research's Materials Research Science and Engineering Center (MRSEC) program. The Center led by Prof. Herbert Herman, along with Professors Chris Berndt and Sanjay Sampath, converted a fledgling but successful academic activity in thermal spray materials processing into major multidisciplinary materials activity. The premise of the Stony Brook proposal was that thermal spray allows materials to be synthesized from extreme conditions with novel microstructures that allowed important functionalities in engineering systems.

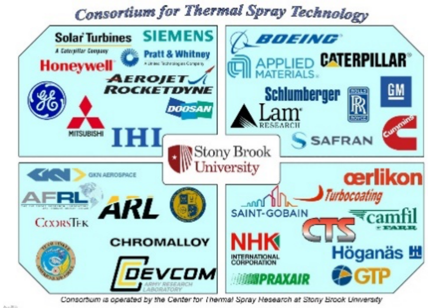




An initial 4 year, ~ $4M grant allowed the core team to bring in fresh perspectives into tackling this complex problem of an existing industrial materials technology. The interdisciplinary thrusts included contributions from scientists at the National Institute of Standards and Technology to apply small-angle x-ray and neutron scattering to study porosity and interfaces in these layered materials. A parallel effort also used neutrons to conduct depth profile of residual stresses. Working with colleagues at MIT, mechanics of these layered, defected materials has enabled new insights on the mechanical behavior of non-traditional materials systems. A unique partnership with the Stony Brook Geoscience department allowed examining the role of the high pressures generated during impact formation of metastable materials. Along the way, the program enabled introducing robustness into the process through study of particle dynamics both during the melting and deposition phases.



Following a successful 1st phase, the program was renewed for a second five year iteration with a promise expansion into new strategies. This included studies of liquid feedstock into the process to synthesize novel chemistries and applications of the process into electronic, magnetic and sensor functions. The Center benefited through a significant, complementary program funded by DARPA to examine the ability of thermal spray for direct writing of functional thick films and sensor devices. In this effort Prof. Sampath led a large group of scientists and engineers to extend the boundaries of thermal spray technologies to create functional surfaces and multilayers. Together, these programs dramatically expanded research and knowledge-transfer activities of the Center for the much of the early to mid 2000s. Along the way, through support from state and industrial partner, a new *state-of-the-art* industrial scale laboratory was established which continues to serve as a unique facility in the US.



As the program approached its life cycle, the Center pivoted to seek Industrial support to continue the developments in research and human resources. An Industrial ***Consortium for Thermal Spray Technology*** was established in 2002 with ten leading companies which allowed initiation of knowledge transfer from fundamental research to industrial practice. The Consortium continues to thrive today with some 30 contributing members with a host of new initiatives in science, technology and development of trained graduates in this unique field of materials enquiry.

The Center's output is significant by all measures. Some 50 PhD students, 40 MS students and 30 post-docs were trained across different disciplines. Hundreds of undergraduates participated and continue to participate in the Center activities learning to handle complex materials processing equipment and characterization methods. Some 500 or more K-12 students participated through the field-trip program. On the intellectual front, the Center output was significant with over 400 refereed publications, 12 book chapters, 7 patents included three licenses. Recognition in the form of several best paper awards, student prizes and faculty recognitions results. New technologies were created and transitioned for industrial use through the consortium as well as through licensing and small business start-ups. Notable, are many of the Center participants and graduates who continue to contribute to the field, bringing scientific perspectives into everyday engineering.

Over the last decade, the Center has continued to push both fundamental boundaries as well as to expand engineering opportunities. Notable areas of continued scientific enquiry include: mechanics and physics of layered structures, hybrid architectures, combining ceramics with metals and polymers for damage tolerance, functional oxides with unique functionalities allowing processing with concomitant application examples and methodologies and metrologies to characterize unique multiscale structures resulting from the process.

A celebratory workshop is planned in 2022 to mark this important milestone and coincident with the 20th anniversary of the Consortium partnership.

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