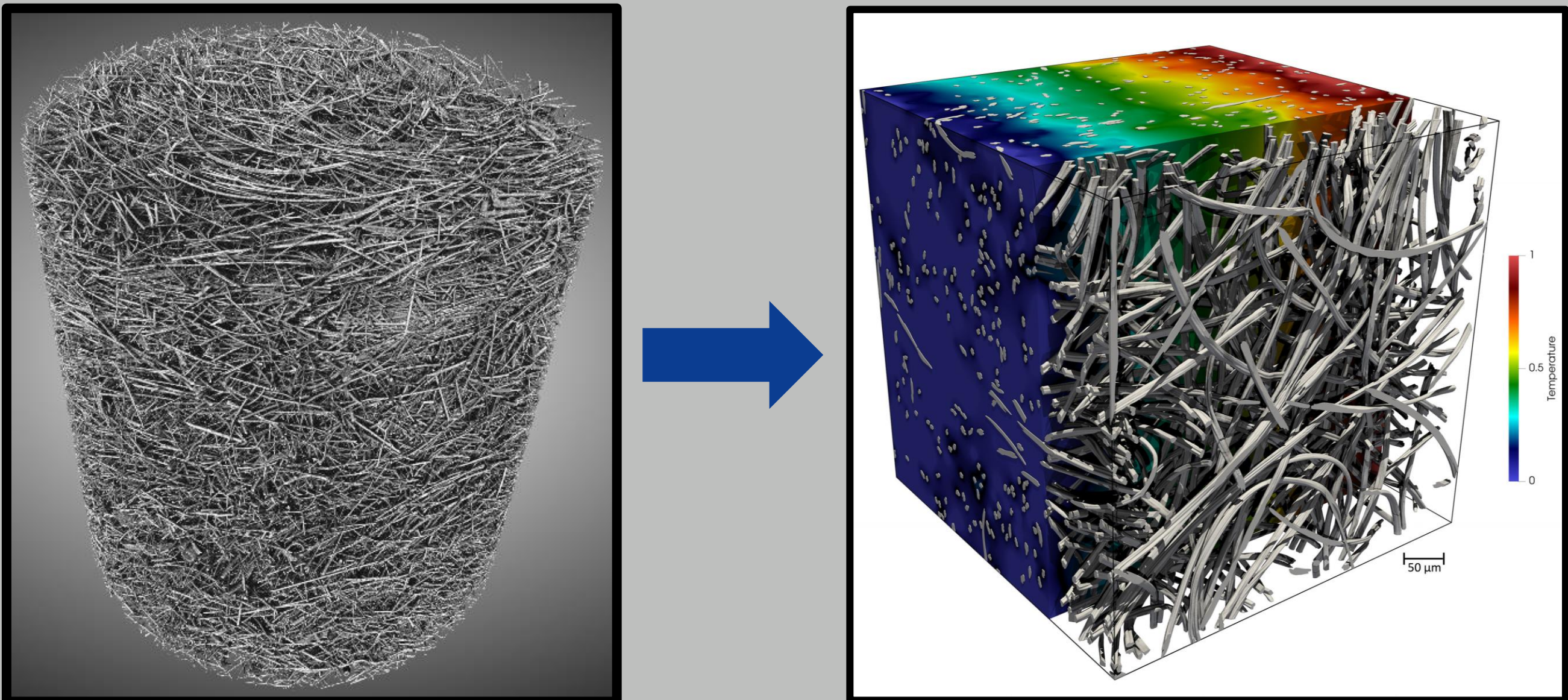


PROTECT: Production & Reuse of Thermally Efficient Ceramic TPS

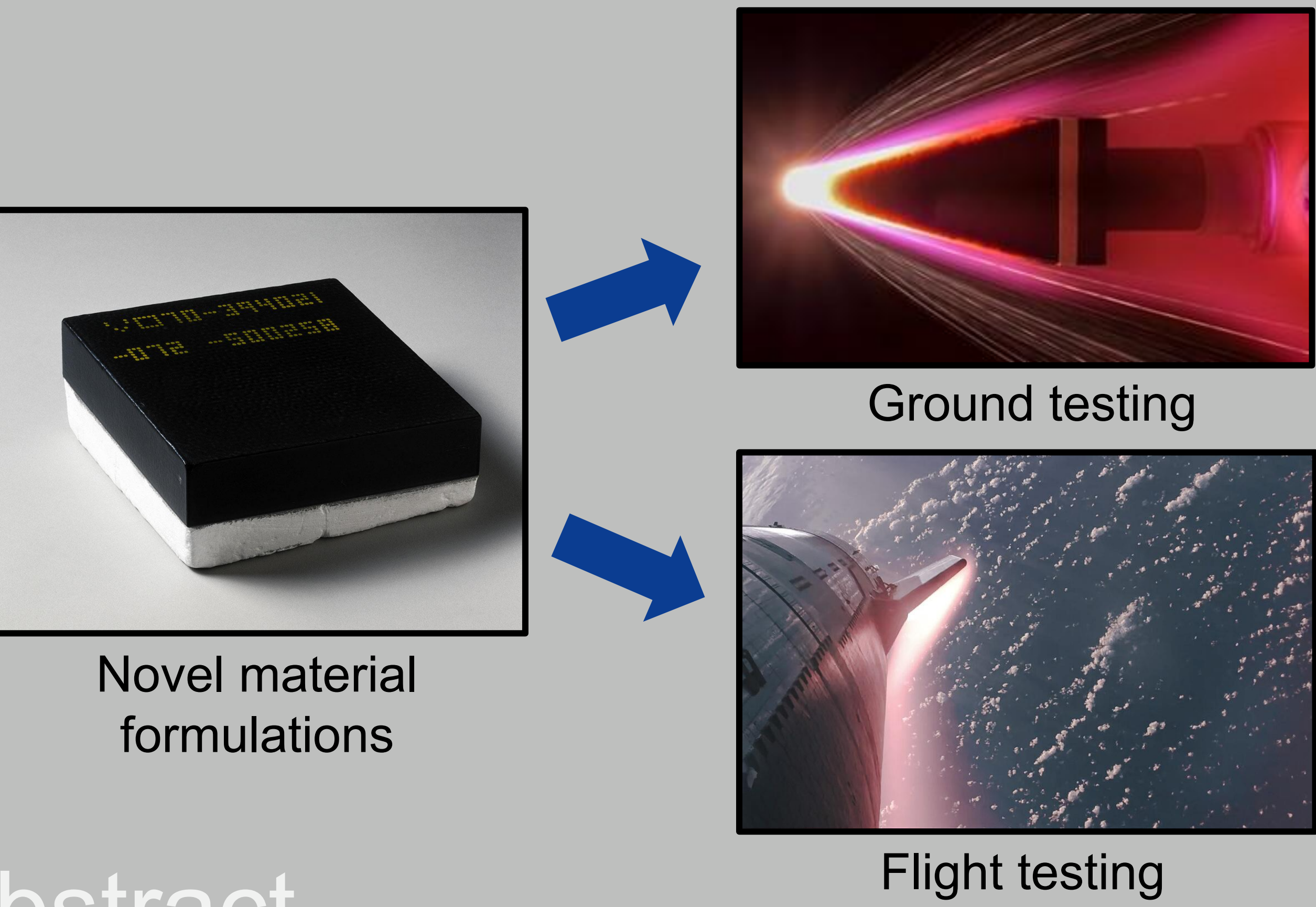
Nate Olson
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Graphical Abstract

From microstructure & raw material properties to material performance metrics...



.... applied to targeted materials design, development, and testing.



Abstract

PROTECT is a NASA Early Career Initiative project that aims to develop and implement a targeted, rapid approach to reusable TPS materials design. PROTECT aims to capture the microstructure of ceramic TPS down to the fiber scale and use that data to build predictive models for thermal and mechanical properties. These tools are then applied to guide material development followed by targeted ground and flight testing.

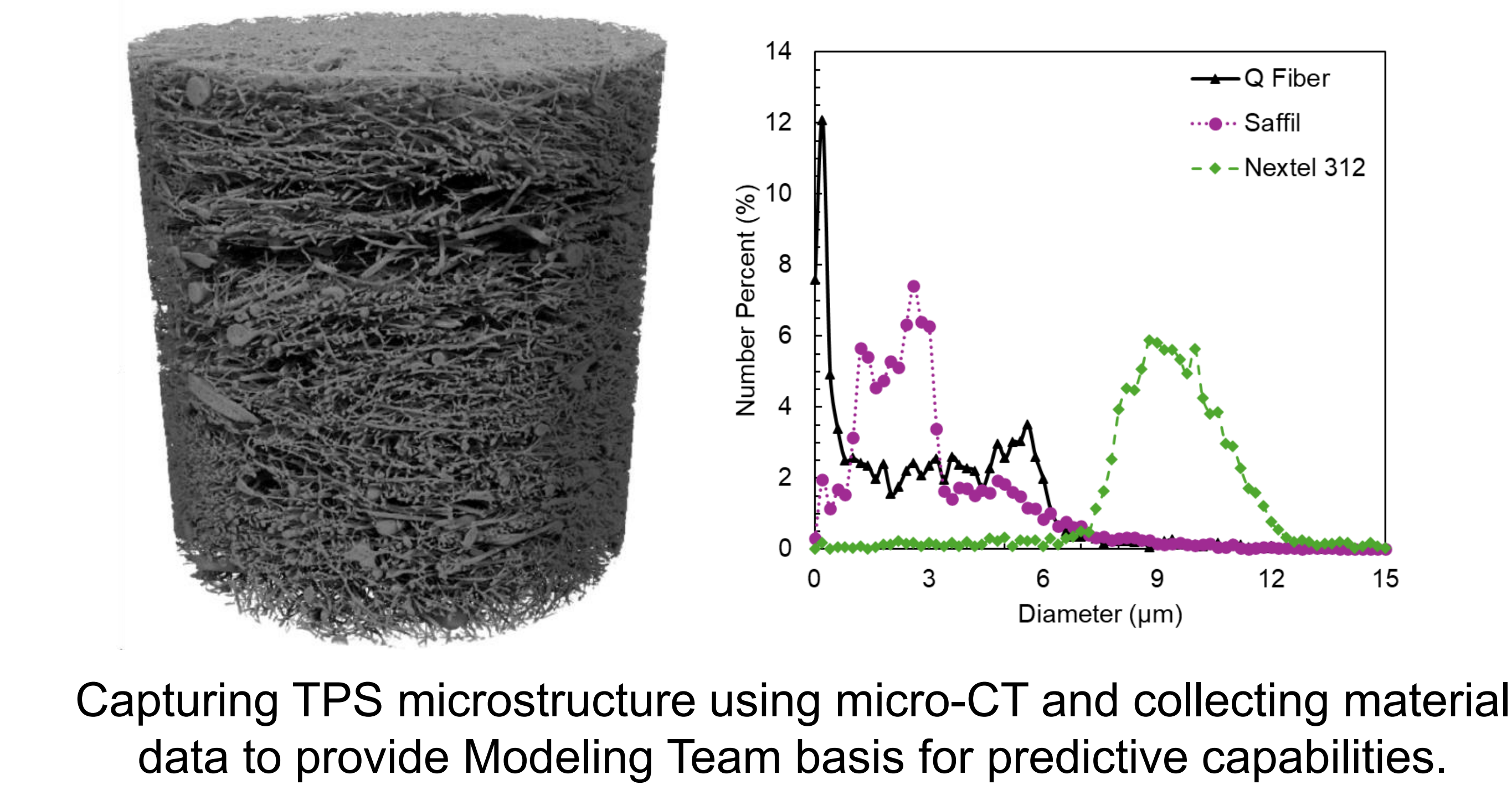
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PROTECT will utilize emerging material characterization methods and advanced computational tools to aid in the design of improved reusable TPS for future NASA and commercial industry space vehicles.

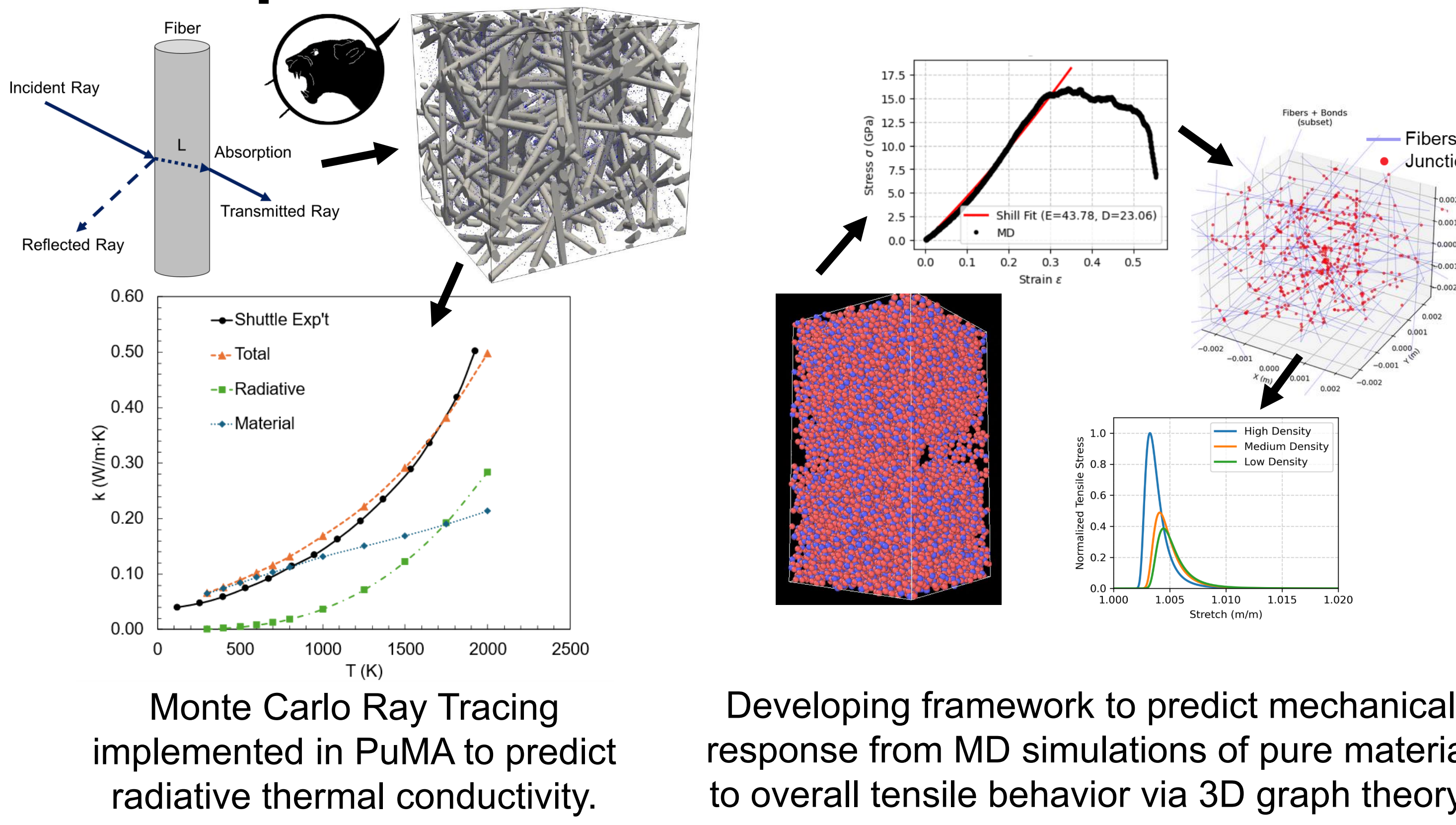
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- | | |
|----------------------------------|--------------------------------------|
| 1 NASA Johnson Space Center | 5 NASA Kennedy Space Center |
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| 3 U of Illinois Urbana Champaign | 7 Oak Ridge National Laboratory |
| 4 NASA Glenn Research Center | 8 SpaceX |

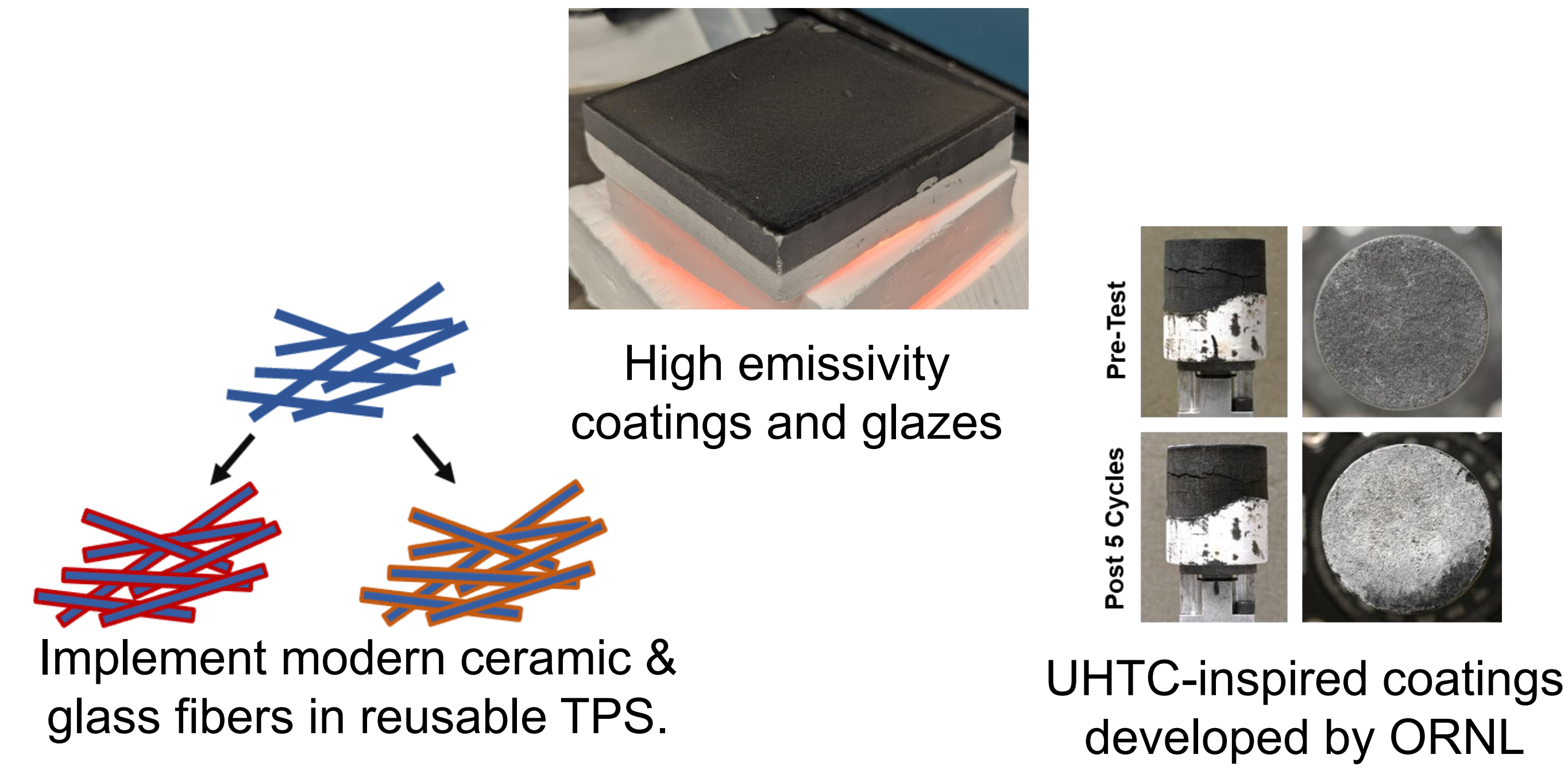
1 Employ advanced characterization tools to capture TPS microstructure and constituent material properties.



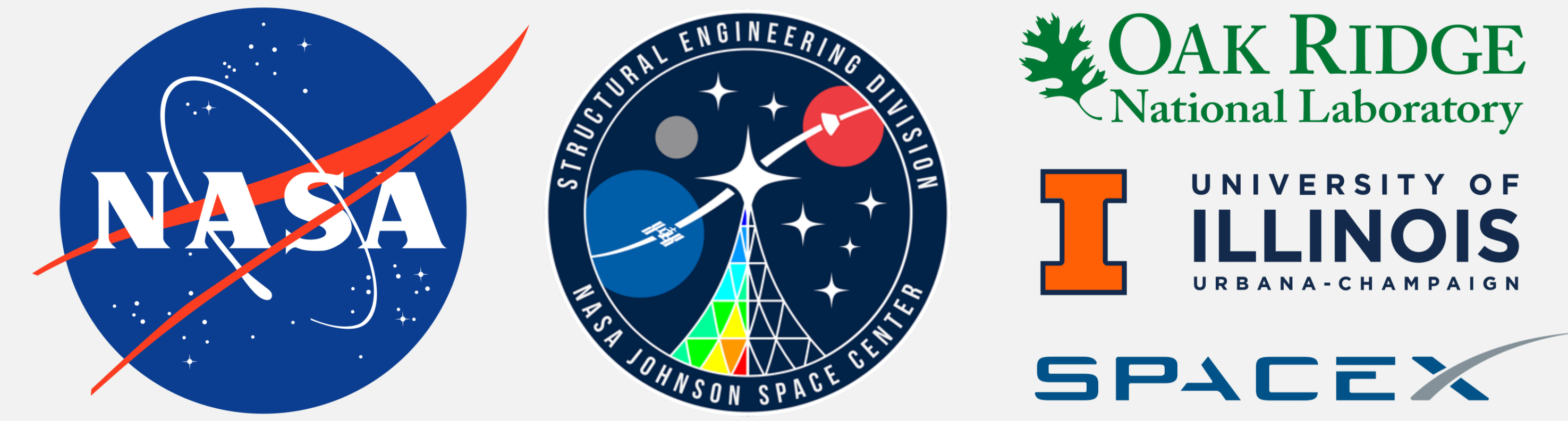
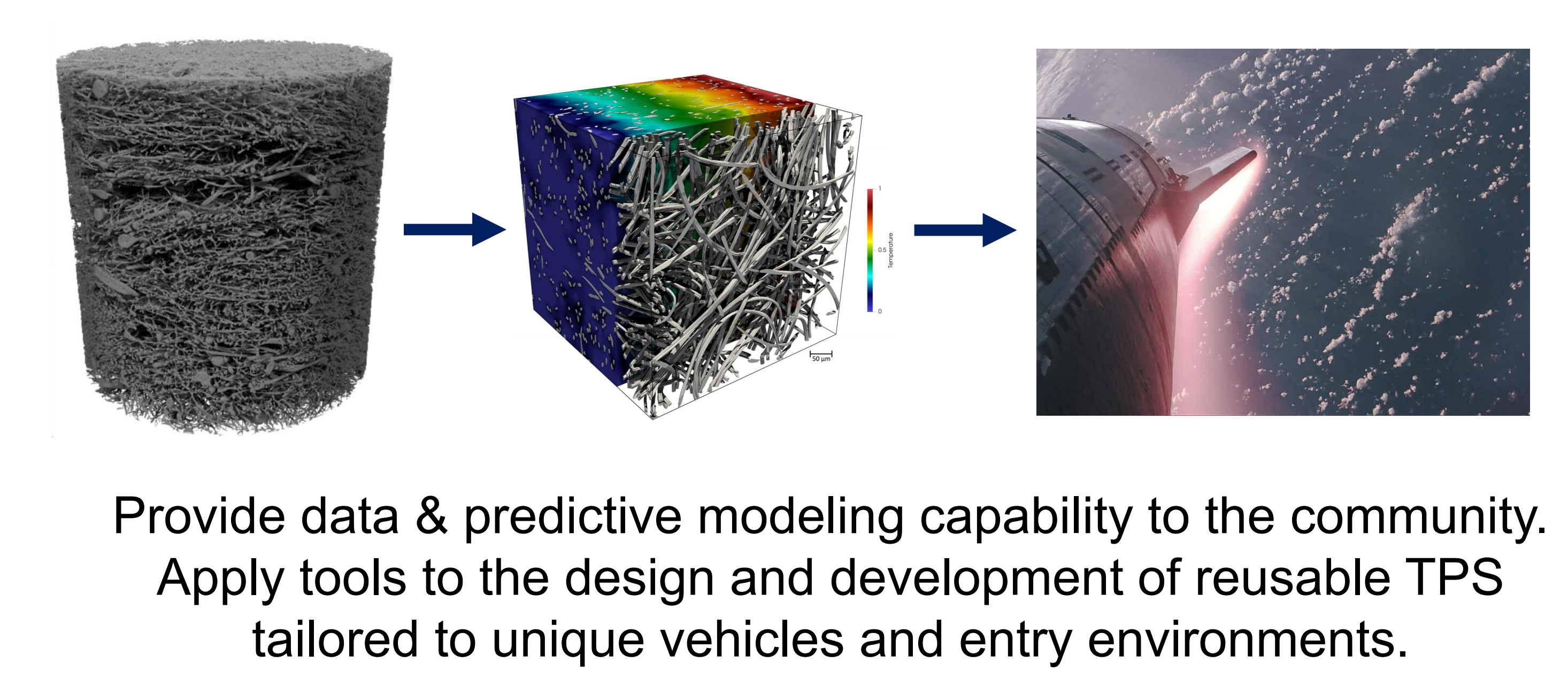
2 Build physics-based predictive capabilities for ceramic fiber TPS.



3 Develop, manufacture, and test reusable TPS with enhanced performance using predictive tools.



4 Translate new development approach to TPS community, enabling design of tailored reusable TPS solutions.



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