INTRODUCTION TO H2020 PROJECT C3HARME - NEXT GENERATION CERAMIC COMPOSITES FOR COMBUSTION HARSH ENVIRONMENT AND SPACE

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Materials for aeronautical and space applications largely involve ceramic matrix composites, CMCs, made of carbon or silicon carbide. However, C/C composites suffer from poor erosion resistance while silicon-based ceramics, SiC/SiC or C/SiC composites, may undergo strong ablation due to the formation and volatilization of silica. In recent years, Ultra-High Temperature Ceramics, UHTCs, have shown outstanding erosion resistance at temperatures up to 2000°C or even higher but they still cannot resist to thermal shocks and damage. Therefore, there is an increasing demand for advanced materials with temperature capability in highly corrosive environments to enable space vehicles to resist several launches and re-entries.

The EU-funded project C3HARME aims at combining the best features of CMCs and UHTCs to design, develop, manufacture and test a new class of Ultra-High Temperature Ceramic Matrix Composite (UHTCMCs) with self-healing capabilities. Applications selected to implement the new materials are near-zero erosion nozzles and near- zero ablation TPS tiles.

This talk aims at giving an introduction to a dedicated session that illustrates the most important challenges addressed by C3HARME project; including the integration between well-established and novel techniques for CMCs and UHTCs production, the need for very high temperature characterization, the meaning of self-healing capability for UHTCMCs, the contribution of modeling to materials development and to investigation of the relationships between microstructure and thermo-mechanical properties.

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