# A COUPLED THERMAL AND MECHANICAL ANALYSIS OF SINTERING IN THERMAL BARRIER COATINGS UNDER GRADIENT EXPOSURE

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The dynamic role of sintering on the lifetime of multilayer, multi-material thermal barrier coatings (TBC) is probed through coupled kinetic, thermal, and mechanical models. Experimentally measured physical properties and analytical methods are integrated to understand the results of various novel laboratory scale performance tests simulating realistic operating environments. Both isothermal and gradient tests are explored in this framework for single layer Yttria Stabilized Zirconia (YSZ) and multilayer Gadolinium Zirconate-Yttria Stabilized Zirconia coatings. In both multilayer cases failure between the two material layers can strongly be attributed to sintering, while failure between bond coat and TBC layers exhibit more ambiguity. Overall, this Integrated Computational Materials Engineering (ICME) inspired framework demonstrates utility in understanding the failure of novel multilayer coating architectures. Further use in manufacturing is envisioned by incorporating the effects of process variation through the coatings starting properties and microstructure.