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Silicon Nitride Protective Seal for Thermal Barrier Coating on Gas Turbine Engine Blades to Extend Longevity ELORA ZUCHA, SAID BAKKAR, ELLEN STEINMILLER, JACOB MOLDENHAUER, University of Dallas, TIM HOSSAIN, WILL FLANAGAN, Cerium Labs, UNIVERSITY OF DALLAS COLLABORATION, CERIUM LABS COLLABORATION — A sample representation of a gas turbine engine blade, consisting of a Nickel superalloy substrate with a deposited thermal barrier coating (TBC), was covered with silicon nitride, Si3N4, as a sacrificial layer using chemical vapor deposition (CVD). The silicon nitride layer was used to seal the yttria-stabilized zirconia (YSZ) surface of the TBC to mitigate calcium-magnesium-aluminum-silicon oxide (CMAS) attack. CMAS testing was carried out on the covered and uncovered surfaces by melting 0.1 g of the CMAS powder on the surface in a furnace at 1100 C for 1 hour or under a torch at 1250 ° for 10 minutes. The conformal surface reaction of the sealed layer confirmed no cracking or delamination at high temperatures. Scanning electron microscopy (SEM) micrographs confirmed that the surface of YSZ was successfully sealed. The new coating of silicon nitride was shown to be a viable technique to significantly reduce CMAS infiltration in porous thermal barrier coatings.

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