Quarterly Management Report

2004

WBS Element	Project Title	Contract Number	Contract Start	Contract End
UOL-1	Modeling of CVD Zirconia for Thermal Barrier and Environmental Barrier Coatings	4000016368	10/01/02	09/30/05

Performer Name and Address	Principal Investigator(s)
Thomas L. Starr Chemical Engineering Department University of Louisville Louisville,KY 40292	Thomas L. Starr

BUDGET AND COST REPORT

Prior Year Funds [$K]	84
Total Current Year Commitment $K]	147
Projected Current Year Costs [$K]	164

	O	N	D	J	F	M	A	M	J	J	A	S
Planned Costs	88	91	95	99	105	110	115	121	126	139	151	164
Actual Costs	81	90	94	98	103	107	0	0	0	0	0	0
Variance	7	1	1	1	2	3	115	121	126	139	151	164

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
UOL-1-1	Identify method to increase YSZ deposition rate	04/30/03		03/31/03
UOL-1-2	Model deposition for vane/blade geometry	09/30/03		09/30/03
UOL-1-3	Optimize precursor solution	06/30/04		
UOL-1-4	Determine microstructure/processing relationships	12/31/04		
UOL-1-5	Design full-scale reactor	09/30/05		

TECHNICAL HIGHLIGHTS

3-D modeling continues toward design of a sub-scale reactor to demonstrate rapid uniform deposition of thermal barrier coating on a full-width (12-cm) turbine blade section. At high deposition rate (> 20 micron/hour) coating uniformity depends on uniform delivery of reactants to the blade surface. A practical reactor design likely will involve one or more small inlet nozzles impinging onto the blade surface. Previous model runs with a single 1-cm inlet nozzle showed a parabolic deposition rate profile with +/- 30% variation over the full blade width. Model results for new designs with two and three nozzles show improved variability with +/- 10% variation in the central region of the blade. While the average deposition rate varies with temperature, reactant concentration and flow rate, the coating variability is related primarily to the geometry of the inlets - their location and spacing.

The above designs all involve steady-state reactor conditions with uniform reactant flows in all nozzles over the entire deposition period. A new approach involving variation of reactant flow rate over time is being evaluated. This would allow active control of coating uniformity during each turbine coating run.

ISSUES

None.

Report Prepared By	Date
Thomas L. Starr	04/23/04