Quarterly Management Report

WBS Element	Project Title	Contract Number	Contract Start	Contract End
ORNL-1(B)	Corrosion Resistant Coatings	FEAA028	10/01/99	09/30/31

Performer Name and Address	Principal Investigator(s)
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BUDGET AND COST REPORT

Prior Year Funds [$K]	75
Total Current Year Commitment $K]	225
Projected Current Year Costs [$K]	300

	O	N	D	J	F	M	A	M	J	J	A	S
Planned Costs	25	50	75	100	125	150	175	200	225	250	275	300
Actual Costs	17	38	69	73	84	93						
Variance	8	12	6	27	41	57	175	200	225	250	275	300

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
ORNL-1(B)-1	Submit a publication on a set of the ceramic series test results from the 2001/2002 NETL-CERF run.	04/30/05	06/30/05	
ORNL-1(B)-2	Evaluate materials properties of rare-earth and/or alkaline earth doped aluminates for thermal or corrosion resistance.	09/30/05		
ORNL-1(B)-3	Complete the deposition and evaluation of a new solution based conversion coating designed to produce scales other than silica.	09/30/06		
ORNL-1(B)-4	Publish first draft of coating materials/corrosion database.	09/30/07		

TECHNICAL HIGHLIGHTS

Review: In order to utilize the attractive properties of SiC, additional measures must be employed to protect the material from corrosive environments. In many cases, systems are being developed that combine oxide and non-oxide ceramics to take advantage of the properties of both families of materials. For example, oxide ceramic coatings are being deposited on SiC and silicon nitride ceramics to protect the bulk materials from corrosion. Unfortunately, the oxide coatings do not completely prevent oxygen diffusion and thus a silica layer is formed between the substrate and the coating. Due to a low modulus and coefficient of thermal expansion (CTE), silica is not compatible with either the coating or the substrate. It is believed that the silica layer will continue to grow with time, albeit very slowly, and eventually cause the coating to fail and spall during thermal cycling. This program has been investigating several approaches to improving the environmental stability of SiC and silicon based materials. One approach that is being taken is to coat the surface of a hexaloy SiC substrate using slurry based coatings.

Results: Development continues on the improvement of dip coat slurry stability through the evaluation of alternative dispersants and binder systems. Studies of mullite, doped alumino-silicates, and doped alkaline earth silicates dip-coated SASiC substrates continued. The substrates that yielded dense and even coating thicknesses of 20 microns were submitted for exposure in simulated environments to determine the effects upon mechanical properties and coating phase stability. The coatings were tested at 1200 celcius in moist air at atmospheric pressure for 500 hours. The first set of coatings (mullite on SASiC) has been removed. Phase analysis of the top surface is currently being determined via XRD. Once phase analysis has been completed, the samples will be broken using an adapted 4 point tensile test to determine the effect of exposure upon mechanical properites. Postmortem analysis will be completed on all broken samples.

Work has also continued on the evaluation of the activities and reactivity of candidate materials for corrosion resistance in controlled environments. The doped aluminate system is still of interest for thermal and corrosion resistance. New materials were acquired to begin characterization, and monolith fabrication was initiated. A paper summarizing the results of the calcium aluminate environmental testing and the resulting mechanical property evaluation is in-process. This is a milestone that has been postponed until June 30 from April 30, 2005.

Collaboration with a DE project, "Environmental Protection Systems" continues.

ISSUES

None to report.

Report Prepared By	Date
B.L. Armstrong	04/11/05