Quarterly Management Report

WBS Element	Project Title	Contract Number	Contract Start	Contract End
ORNL-4A	Controlled Oxidation for Functional and Protective Surfaces			

Performer Name and Address	Principal Investigator(s)
ORNL	M.P. Brady, P.F. Tortorelli, and E.A. Payzant

BUDGET AND COST REPORT

Prior Year Funds [$K]	18
Total Current Year Commitment $K]	200
Projected Current Year Costs [$K]	218

	O	N	D	J	F	M	A	M	J	J	A	S
Planned Costs	15	30	40	60	80	100	125	150	175	200	218	218
Actual Costs	6	20	40	60	82	106						
Variance	10	10	0	0	(2)	(6)	125	150	175	200	218	218

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
2D/4A 1	Submit at least 2 journal papers on oxidation phenomena in multi-component and/or multi-phase alloys relating to complex phase formation or selective	12/30/03		12/30/03
2D/4A 2	Evaluate potential to form Ti3AlC2 and related phases by thermal carburization of Ti3Al and document results in a report	09/30/04		

TECHNICAL HIGHLIGHTS

Work this quarter began on the new effort “Controlled Oxidation for Functional and Protective Surfaces”. It is based on phenomena observed during the oxidation of two-phase Cr-Cr2Ta and related alloys as part of the recently completed multi-phase Cr-based alloy development project. Efforts directed towards new approaches to achieving protective scale formation in aggressive high-temperature environments and the use of oxidation reactions as a synthesis approach to novel, near-surface ceramic structures for functional applications (ranging from catalysts and sensors to wear and oxidation resistant surfaces) will be pursued. The work on alloy design for oxidation protection is linked with the 2A “Multi-Phase High-Temperature Alloys” effort.

A series of Mo-Co, Mo-Ni, and Ti-Al alloys were cast to investigate the formation of complex carbide and nitride phases of functional interest through gas reactions of intermetallic precursor phases. This proposed synthesis approach offers two potential advantages: 1) the formation of new compounds based on unexplored intermetallic precursor stoichiometries (there phases are typically formed from complex oxide or chemical precursors which offer a different set of potential stoichiometries and structures than do intermetallics), and 2) the potential to form local composite structures through preferential in-place reaction of intermetallic precipitates. In particular, promising preliminary results were obtained by carburization of CoMo-containing precursor alloys to form Co3Mo3C2 phases of interest for hydrotreating of fossil fuels, ammonia synthesis, and water gas shift reaction catalysis. This result establishes the potential of this approach to synthesize phases of technological interest to the Fossil Program.

ISSUES

None

Report Prepared By	Date
MP Brady	06/01/04