Quarterly Management Report

WBS Element	Project Title	Contract Number	Contract Start	Contract End
01	Development of Seals for Membranes	12461	10/01/03	09/30/05

Performer Name and Address	Principal Investigator(s)
Pacific Northwest National Laboratory 902 Battelle Blvd P.O. Box 999 Richland WA 99352	K Scott Weil

BUDGET AND COST REPORT

Prior Year Funds [$K]	218
Total Current Year Commitment $K]	618
Projected Current Year Costs [$K]	504

	O	N	D	J	F	M	A	M	J	J	A	S
Planned Costs	42	84	126	168	210	252	294	336	378	420	462	504
Actual Costs	22	44	55	76	100	119	138	170				
Variance	20	40	71	92	110	133	156	166	378	420	462	504

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
3-1	Complete studies on the effects of Pd alloying on the liquidus temperature and wetting mechanisms of Ag-CuO.	11/30/04		11/30/04
3-2	Initiate study of the effects of TiO2 on the liquidus temperature and wetting mechanisms of Ag-CuO.	02/28/05		01/31/05
3-3	Evaluate the corrosion resistance of a ceramic membrane/alloy gas manifold joint, brazed using one of the newly developed brazing filler metal systems, in	05/31/05		05/31/05
3-4	Develop an internal source of exothermic heating to melt the air brazes locally in place.application in H2 separation.	09/30/05		

TECHNICAL HIGHLIGHTS

Evaluate the corrosion resistance of a ceramic membrane/alloy gas manifold joint, brazed using one of the newly developed brazing filler metal systems, in simulated coal gas (in partial completion of Milestone 3-3)

We initiated a demonstration study aimed at using air brazing as a method of YSZ to stainless steel joining for testing under a coal gas environment. The objective was to examine the air brazed joint before and after exposure, while measuring the open circuit voltage of the 7micron YSZ membrane (and therefore the hermeticity of the seal) during testing. The 4mol% CuO braze paste was dispensed onto the YSZ membrane, which was fixtured against a corresponding Crofer-22 APU frame. Brazing was conducted in ambient air at 1050°C for 15min, forming a peripheral seal that measured on average ~3mm wide by ~100microns thick. After applying the appropriate electrode materials, the configuration was operated at 750°C for 120hrs on 2 lpm of a prototypic coal gas mixture: 41% H_2, 29% CO, 22% CO_2, 7% H_2O. Throughout testing, a theoretical OCV of 1.07V on average was obtained, indicating that the seal remained fully hermetic. SEM analysis of the seals indicated little change in the braze microstruture due to exposure. Exposure testing will be conducted out to longer times at temperature to determine the stability of the brazed seal in the coal gas environment as a function of time.

Papers Submitted/Published During the 3rd Quarter of FY2005

1. K. Scott Weil, Jin Yong Kim, and John S. Hardy, "Reactive Air Brazing: A New Method of Sealing Solid Oxide Fuel Cells and Other Solid-State Electrochemical Devices," Electroch. & Sol. St Lett., in press.
2. J. Darsell and K. S. Weil, "An Interfacial Characterization of Pd-Ag-CuO Reactive Air Braze Joints with Alumina," Proceedings of the 2005 Annual Meeting of the American Ceramic Society, the American Ceramics Society, 2005.
3. K. S. Weil, J. Y. Kim, and J. S. Hardy, "Critical Point Wetting Phenomena in the Ag-CuO System," Proceedings of the 2005 Annual Meeting of the American Ceramic Society, the American Ceramics Society, 2005.
4. K. Scott Weil, Jin Yong Kim, and John S. Hardy, "Interfacial Analysis of $(La_{0.6}Sr_{0.4})(Co_{0.2}Fe_{0.8})O_3$ Substrates Wetted by Ag-CuO," J. Mater Sci., in press.

ISSUES

Report Prepared By	Date
K Scott Weil	06/10/05