CERAMIC MEMBRANE ENABLING TECHNOLOGY
FOR IMPROVED IGCC EFFICIENCY

QUARTERLY TECHNICAL PROGRESS REPORT

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ABSTRACT:

This quarterly technical progress report will summarize work accomplished for Phase 2 Program during the quarter April to June 2004. In task 1, long term testing of OTM elements at different temperatures and process conditions continued. In task 2, OTM elements were manufactured as necessary for task1. In task 7, advanced OTM and cryogenic IGCC cases for near-term integration were developed, leading to cost requirements for commercial viability. In task 9, discussion with DOE regarding restructuring the program for subsequent phases were initiated.

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A. Executive Summary

The objectives of the second year of phase 2 of the program are to construct and operate an engineering pilot reactor for OTM oxygen. Work to support this objective is being undertaken in the following areas in this quarter:

- Element reliability
- Element fabrication
- IGCC process analysis and economics

The major accomplishments this quarter were

- **Long term life test of OTM element passed nine months at different testing conditions**

B. Experimental Methods

B.1. OTM Element Reliability Experimental Methods

Characterization of OTM and substrate materials has been undertaken using many different experimental procedures. These include permeation, crystallographic, thermomechanical, thermochemical and electrochemical measurements. In addition oxygen permeation testers were used to collect oxygen and measure the oxygen flux of OTM elements.

B.2. Element Manufacturing Experimental Methods

Various fabrication routes have been developed to prepare composite OTM samples. The fabrication routes used have been discussed previously.

B.3. Process Analysis and Economics Experimental Methods

HYSIS simulations are used to model various process options.

C. Results and Discussion

C.1. OTM Element Reliability Results and Discussion

OTM life tests continued with multiple life tests passing the six-month mark and one test passing nine months. Element reliability at higher testing temperatures (900°C+) indicates commercial reliability of the OTM will be hard to obtain at such temperatures.

C.2. Element Manufacturing Results and Discussion

Elements for life and cycle testing were produced as required for testing in task 1.

C.3. Process Analysis and Economics Results and Discussion

OTM processes were developed and cryogenic processes for integration with near-term IGCC processes were updated to produce cost targets for the OTM.

C.4. Program Management

Negotiations were initiated to restructure the program for the next phase of the program. Full communication of technical and economic hurdles was presented to DOE at NETL on June 7th, 2004.

D. Conclusion

Progress has been made toward achieving the DOE-IGCC program objectives. In task 1, life tests at < 900C have passed 9 months, and element reliability testing at higher temperatures indicates that at temperatures 900C and higher commercial reliability will be difficult to obtain. In task 2, elements were produced as necessary for task 1. In task 7, advanced OTM and cryogenic IGCC cases for near-term integration were developed that provide cost targets for the OTM modules.