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ADVANCED DIRECT LIQUEFACTION CONCEPTS for PETC GENERIC UNITS Phase II

Quarterly Technical Progress Report for Period January through March 1999

by

University of Kentucky
Center for Applied Energy Research

CONSOL Inc.

Hydrocarbon Technologies, Inc.

LDP Associates

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Disclaimer

ABSTRACT

The results of Laboratory and Bench-Scale experiments and supporting technical and economic assessments conducted under DOE Contract No. DE-AC22-91PC91040 is reported for the period January 1, 1999 to March 31, 1999. This contract is with the University of Kentucky Research Foundation, which supports work with the University of Kentucky Center for Applied Energy Research, CONSOL, Inc., LDP Associates, and Hydrocarbon Technologies, Inc. This work involves the introduction into the basic two-stage liquefaction process several novel concepts, which include dispersed lower-cost catalysts, coal cleaning by oil agglomeration, and distillate hydrotreating and dewaxing. This project has been modified to include an investigation into the production of value added materials from coal using liquefaction based technologies.

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EXECUTIVE SUMMARY

The continuing preparation and revision of the new work outline has continued this quarter, with discussions and submissions involving CAER, CONSOL Inc, HTI and LDP Associates.

The continuing laboratory work has focussed on the stability of ATTM and ADTM by Mo-95 NMR. Several manuscripts have also been prepared and submitted this quarter.

2. SECTION ONE

UNIVERSITY OF KENTUCKY
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TASK 2. LABORATORY SUPPORT (UKCAER)

The main effort during this quarter involved the preparation of the revised work outline following discussion and submissions from each party.

Laboratory work underway during this quarter involved further investigations of the stability of ammonium tetrathiomolybdate (ATTM, $(NH_4)_2MoS_4$), ammonium oxythiomolybdate (ADTM,$(NH_4)_2MoO_2S_2$) and ammonium molybdate ($AM(NH_4)_4MoO_4$) by Mo-95 NMR in 5% Na_2CO_3 in deuterium oxide(D_2O). Final experiments are being completed at elevated temperatures with results that differ markedly with those reported in the literature at room temperature. Submission of the paper will be to the *Journal of Magnetic Resonance* in the coming months. The temperature studies of ATTM and ADTM at 90, 70, 60 and 50^o C are being carried out. Additional studies are planned to carry over into the next quarter.

For the experiments involving molybdenum/vanadium compounds, the preparation of V-51 NMR standards is being planned. The $VOCl_3$ standard was found to be unusually corrosive.

The tungsten reference, sodium tungstate, Na_2WO_4, standard at 10%concentration in distilled water has failed to yield a detectable NMR signal. This is for the characterization of our synthesized WMA compound. Work on this problem is continuing.

Publications in preparation.

The paper entitled "Direct Liquefaction of Wyodak Coal Using Oxomolybdates and Molybdenum Sulfides as Catalysts" is being prepared for submission for publication in *Energy & Fuel*.

The paper, "Direct Liquefaction of Wyodak Coal Using Molybdenum Sulfides as well as Vanadium and Tungsten-vanadium phosphomolybdates as Catalyst Precursors " was accepted for presentation at the 217th National meeting of the American Chemical Society this March 21-25, 1999.

Preparation of a paper for submission to *Energy & Fuel* has begun which combines the results of two Energy & Fuels preprint papers presented at the past Dallas and Boston National ACS Meetings authored by Zhan, Givens, Demirel and Van Woert.