DOE/PC/91343--79

Contract Numbers:

DOE DE-AC2292PC91343

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OCDO CDO/R-90-21

Project Title:**IGR NO_x/SO_x
Control Technology**Reporting Period:

January 1 to February 28, 1995

Due Date:

March 31, 1995

Contractor Name:**IGR Enterprises**
11000 Cedar Avenue
Cleveland, Ohio 44106
(216) 721-5511Project Start:

September 25, 1992

Project Completion:

September 24, 1997

Approach Changes:

None

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ACQUISITION & ASSISTANCE DIV.**IGR**

Performance Variances, Accomplishments, or Problems:

SUMMARY

During the first quarter of 1994, work was concentrated on improving the power efficiency of the IGR NO_x/SO_x control technology. IGR continued to work on its electrocatalyst materials to improve the electrical efficiency required for economical NO_x/SO_x destruction. In addition IGR continued to modify the electrocatalyst/electrolyte interface with the goal of improving selectivity and current efficiency. Specifically, work concentrated on changing the solid state defect concentration in the solid oxide electrolyte both on the surface and in the bulk. Results from two months of work indicate that these modifications have significantly improved current efficiency. For some conditions the current efficiency was improved by *a factor of ten*. Further work has been truncated as we have reached the end of the Phase I term of this research contract.

DISCUSSION

A. ELECTROLYTE/ELECTROCATALYST PREPARATION

In IGR's recently proposed model for NO_x/SO_x removal, it was theorized that both the electrocatalyst and electrolyte were important in the removal of NO_x/SO_x. Accordingly, in recent work, IGR has concentrated its research efforts on an improved electrocatalyst/electrolyte interface. Some of the previous work involved applying coatings of different solid oxide electrolyte formulations to the stabilized electrolyte before

application of the electrocatalyst. These tests did not give any significant and reproducible improvement in current efficiency. It is possible that these results were a function of the application method and not the composition. Therefore several modified electrolyte compositions were prepared where the additives were uniformly mixed throughout the electrolyte. Samples were then prepared in the standard manner. Results indicate that some modifications to the electrolyte, in combination with the electrocatalyst, were able to improve current efficiency for nitrogen oxide removal significantly (10X) over the best previously achieved for NO_x removal. (Comparable results using this technique with sulfur dioxide removal were ambiguous as of conclusion of the Phase I term.) This current efficiency improvement (for nitrogen oxide removal) appeared to be substantially *independent of oxygen levels* and was fully maintained at 5.7% oxygen, the highest level under test in this work. These results were reproducible over the last six weeks of the Phase I work. The best results were achieved at 425°C.

Projections show that utility units using this technique for nitric oxide control, at the current state-of-the-art, would require about 0.6% of the plants electrical output to operate the IGR nitric oxide unit. Our original "perfect result" projections called for about 0.2% of the plants output. Further experimental work could easily reach or exceed that lower value..

The logo consists of the letters "IGR" in a bold, italicized, sans-serif font. To the right of the letters is a small, dark silhouette of a butterfly.

Open Items: None

Status Assessment & Forecast:

Further work has been truncated as we have reached the end of the Phase I term of this research contract.

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