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## TECHNOLOGY DEVELOPMENT FOR COBALT F-T CATALYSTS

Contract No. DE-AC22-92PC92108

### QUARTERLY TECHNICAL PROGRESS REPORT No. 13

Covering the Period October 1, 1995 to December 31, 1995

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## EXECUTIVE SUMMARY

Eight new catalysts were prepared by Calsicat during this reporting period in order to investigate the effect of the reduction and passivation procedures which would be typically used on commercial batches of catalysts. These new catalysts had similar formulations to those used previously for Co.005 and Co.047. The main differences between the catalysts in each of these two catalyst series reside in the reduction and passivation procedures used.

A total of 8 runs were performed in the slurry bubble column reactor (SBCR) in order to evaluate the reduction procedure which would be used on large batches of catalysts as well as the passivation procedure using soya wax coating of the Co catalysts after reduction in  $H_2$ .

A series of three non-promoted  $Co/Al_2O_3$  catalysts calcined and reduced at Calsicat under semi-commercial conditions and flaked in soya wax for easier handling and shipment of the reduced catalysts yielded very low CO conversions in the SBCR. However, a small batch of the same catalyst reduced in the laboratory scale reduction system at EI was very active. On the other hand a larger batch of the same non-promoted catalyst hydrogen reduced in the same laboratory scale reduction unit yielded also a very low CO conversion in the SBCR. In addition, the larger batch reduction process seemed to have irreversibly damaged this catalyst which could not be reduced completely even when the catalyst was re-reduced in small batches at standard conditions yielding usually completely reduced catalysts. The large amount of water produced during reduction of large batches of catalysts is suspected to affect the reducibility of these non-promoted catalysts. None of the problems encountered with the reduction and passivation of the non-promoted catalysts were observed with the Ru-promoted catalysts, confirming again that the presence of Ru promotes the reduction of the Co catalysts.

TPR experiments were carried out on both the promoted and unpromoted catalysts in order to determine the optimum time required for complete catalyst reduction. The results of this investigation confirmed previous results showing that Ru acts primarily as a reduction promoter. In addition, the presence of potassium did not alter its effect on Co reducibility. Much longer time was required for the non-promoted catalyst to achieved its maximum reduction.

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