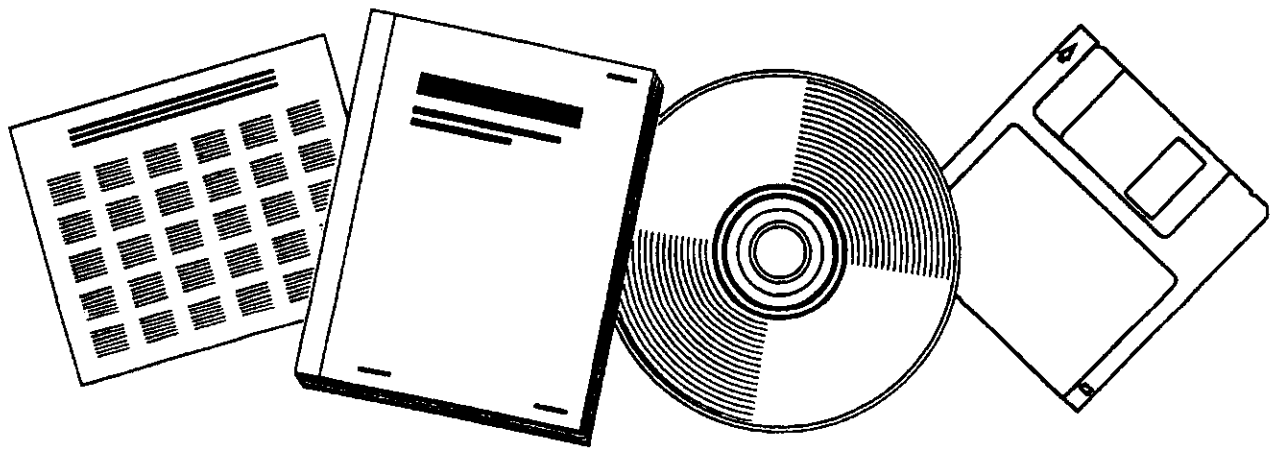
DE99751210

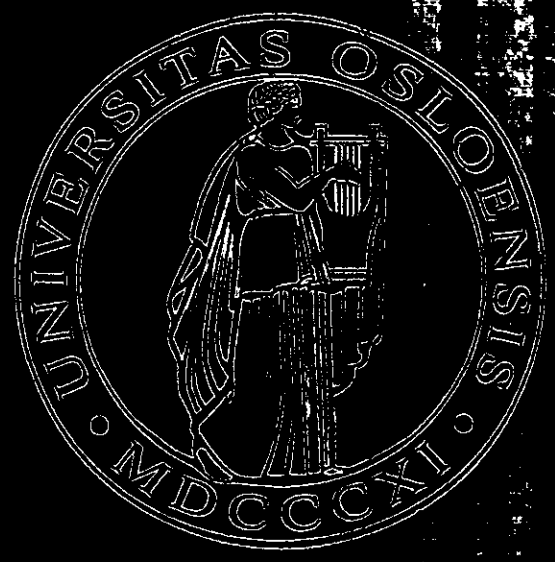
LANTHANUM COBALT OXIDES AS MODELS FOR LA-PROMOTED CO/(GAMMA)-AL(SUB 2)O(SUB 3) CATALYS

OSLO UNIV. (NORWAY)

31 DEC 1998



U.S. DEPARTMENT OF COMMERCE
National Technical Information Service



DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

PREFACE

Cobalt supported on γ-Al_2O_3 have for a long time been interesting catalysts for the synthesis of hydrocarbons by hydrogenation of carbonmonoxide, the so-called Fischer-Tropsch synthesis, and the properties of these catalysts are largely improved by addition of promotors like rhenium and lanthanum. The background for this study was to provide additional knowledge to the nature of the reduction processes from metaloxides via partially reduced phases into metal and to the large degree of interaction/reaction between the catalyst components. With my background in the field of solid state chemistry the work has focused on detailed studies of model oxides in the La-Co-O and Co-Al-O systems under reducing conditions typically used for the synthesis of the catalysts.

The major part of the work presented in this thesis has been performed at the Section for Inorganic Chemistry and Materials Science at Department of Chemistry, University of Oslo, with Professor Helmer Fjellvåg as supervisor. However, the high resolution powder X-ray diffraction measurements were conducted at the Swiss Norwegian Beam Line (BM1) at ESRF (Grenoble, France), the powder neutron diffraction experiments at Institutt for energiteknikk (Kjeller, Norway) and temperature programmed reduction at Statoil Research Center (Trondheim, Norway).

In addition to the work presented in this thesis, experiments were performed in order to synthesize model compounds of the La-Co-Re-O system, unfortunately without success. Furthermore, a preliminary powder neutron diffraction (PND) study of $La_4Co_3O_{10.00}$ was performed and reported in the proceedings for the *Solid State Chemistry '96* Conference, Bratislava (1996).[a] The PND study and the high resolution X-ray study presented in Paper 3 of this thesis showed that high resolution PND data were required for a complete analysis of additional PND reflections of both crystallographic and magnetic origin. Hence, high resolution PND data were collected for $La_4Co_3O_{10.00}$ and $La_4Co_3O_{10.30}$ at D2B, ILL (Grenoble, France). Preliminary analysis of the data show that the symmetry of $La_4Co_3O_{10.00}$ is primitive and that considerable tilting of the CoO_6-octahedra in the triple perovskite layers occur. The small displacements of the atoms which give rise to the symmetry lowering was not resolved by X-ray diffraction (cf. Paper 3, p. 55 - 59).

Acknowledgements

This work has been fully dependent on the financial support from the Norwegian Research Council through the project on conversion of natural gas, which is gratefully acknowledged.

Special thanks to Helmer - all support, help and encouragement are gratefully appreciated. Many thanks to Bjørn C. Hauback at Institutt for energiteknikk for great help with the powder neutron diffraction studies, to avd. ing. Kari Bjerkelund and avd. ing. Per Fostervoll for all experimental assistance, and to all at the Section for Inorganic Chemistry and Materials Science for interesting and fruitful discussions.

Oslo, 27.03.98

Ole Henrik Hansteen

TABLE OF CONTENTS