

A SPECTROSCOPIC AND THERMAL STUDY OF COBALT CARBOXYLATES

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Declaration

I declare that this dissertation is my own unaided work, performed under the supervision of Prof. N.J. Coville. It is being submitted for the degree of Master of Science in the Faculty of Science of the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

Avril Ley

_____ day of _____ 2009

Dedicated to Maxine

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Abstract

In South Africa the chemical industry is dominated by Sasol. Currently Sasol produces syngas ($\text{CO} + \text{H}_2$) from coal and/or natural gas, which is converted to hydrocarbon materials and fuels over iron or cobalt catalysts utilizing Fischer-Tropsch technology.

Many of the refinery operations downstream of Fischer-Tropsch synthesis entail hydrotreating. Since the feed is sulfur free, an unsulfided nickel based hydrotreating catalyst is the preferred catalyst of choice. However the presence of oxygenated products, especially organic acids, in the feed precludes the use of such catalysts due to acid leaching of the nickel. It is thus desirable to find unsulfided catalysts that can decarbonylate the organic acids prior to hydrotreating. It has been suggested that metal-carboxylate interactions could narrow the field in search of commercial catalysts for the decarbonylation of carboxylic acids.

In this project, a systematic study of cobalt(II) carboxylates was undertaken. Their purity was determined using IR and their thermal decomposition behaviour studied using TGA and DSC.

The cobalt compounds were found to be sufficiently pure for further investigation using IR. These materials decompose between 265°C and 400°C making cobalt a poor candidate for use as commercial decarbonylation catalysts.

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