New Catalysts for Hydroprocessing:

Molybdenum and Tungsten Phosphide

Paul Clark

Dissertation submitted to the faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Chemical Engineering

S. Ted Oyama, Chairman

David F. Cox

Kimberly Forsten

Stephen L. Kampe

Uri Vandsburger

September 29, 2000

Blacksburg, Virginia

Keywords: hydrodenitrogenation, molybdenum, tungsten, phosphide

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by

Paul Clark

Committee Chairman: S. Ted Oyama

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Abstract

This dissertation describes the preparation and application of a novel class of hydroprocessing catalysts, transition metal phosphides. Concentration was placed on molybdenum and tungsten monophosphides because of the importance of these elements in standard sulfidic hydrotreating catalysts. Transition metal phosphides exist over a wide range of stoichiometry, and their properties have a great deal of variation, ranging from phosphorus poor compounds with metallic electrical properties to phosphorus rich compounds with semiconducting or insulating properties. The x-ray diffraction patterns of the phosphides studied here were unchanged under the conditions of catalytic hydroprocessing, demonstrating their stability toward the hydroprocessing conditions and allowing study of their intrinsic catalytic properties. Materials were prepared in bulk form, supported on alumina, and supported on silica.

The mechanism of hydrodenitrogenation on MoP/SiO_2 and WP/SiO_2 catalysts was investigated by comparison of hydrodenitrogenation reactions of pyridine, piperidine, *n*-pentylamine, *tert*-pentylamine, and *neo*-pentylamine.

Acknowledgments

This thesis is dedicated to Charles C. Clark, PhD.

I am grateful to my mother and father for their love and patience, and for teaching me responsibility.

I thank my wife, Ingrid, for her love and patience with me through these years. I am grateful for my children, Kathryn and Lucas.

I express my gratitude Professor S. Ted Oyama for the opportunity to do this work. I will always respect his teachings regarding how to work and how to think.

I thank my committee members for their time and insight.

I appreciate the support and companionship of my laboratory colleagues, Mark Abee, Chad Byrd, Bala Dhandhapani, Rajat Kapoor, Doohwan Lee, Wei Li, Toby Lucy, Anil Prabhu, Rakesh Radhakrishnan, Corey Reed, Celine Sayag, Viviane Schwarz, Todd St. Clair, Victor Teixiera da Silva, and Xianqin Wang.

I also thank the department and university staff, Wendell Brown, Diane Cannaday, Judy Coleman, Riley Chan, Frank Cromers, Chris Moore, Diane Patty, Carol Stables, Todd Solberg, and Dean Trindle, for their help in accomplishing many tasks.

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