DEVELOPMENT OF A PFD FOR A NANOLUBRICANT BASED ON CEYLON VEIN GRAPHITE

Jayangi Dinesha Wagaarachchige

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Degree of Master of Science

Department of Chemical and Process Engineering

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Prof. A. A. P. de Alwis

Professor of Chemical and Process Engineering,

Department of Chemical and Process Engineering,

University of Moratuwa

Abstract

The thesis presented the information on Sri Lankan natural vein graphite resource, world nanotechnological approaches in tribology and the connection between nanotechnology, tribology and Sri Lankan vein graphite.

Along with the case study on chronological timeline of vein graphite, exploitation started in 1829, peaks at 1916 and has been dropped down since 1917. Considerable damage for graphite resource of Sri Lanka has happened in British colonial era. The market analysis of graphite export industry in Sri Lanka indicates several reasons for decline of graphite export market. The potential of graphite based industries are broad due to its versatile properties without any processing. With the discovery of graphene the importance of graphite moves to a new era of advancement in applications. Therefore Sri Lankan vein Graphite should not be supply to outside of the country without value addition. Need to come-up local investor and technologists to start new graphite era.

In nanotechnology, tribology using nanometerials is a burgeoning research field and there are few nanolubricant products in the market. Information on world tribological approaches on nonmaterial is reviewed. Carbon, Metal dichalcogenides, soft metals, boron based materials and some micelles and encapsulated materials are under exploration of advance tribology.

Further to the lab identifications and literature reviews reflected the potential of nano-engineered lubricant using natural vein graphite. PFD for vein graphite based nanolubricant is presented with some optimization options and advanced techniques as the recommendation for future work.

DEDICATION

I dedicate this thesis to my parents, husband and parents in law, without their patience, understanding support and most of all love, the completion of this work would not have been possible

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J. D. Wagaarachchige

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LIST OF ABBREVIATIONS

Abbreviation	Description
1D	One Dimensional
2D	Two Dimensional
2H	Hexagonal
AF	Anti Friction
AFM	Atomic Force Microscopy
AW	Anti Wear
BGLL	Bogala Graphite Lanka Limited
BGS	British Geological Survey
BL	Boundary Lubrication
CAFÉ	Corporate Average Fuel Economy
CMC	Critical Micellar Concentration
DDP	Dialkyldithio Phosphate
DL	Dry lubrication
DLC	Diamond Like Coatings
DSSC	Die Sensitized Solar Cell
EDB	Export Development Board
EEW	Electric Explosion of Metallic Wire
EHL	Elastro Hydrodynamic Lubrication
GO	Graphite Oxide
HDL	Hydrodynamic Lubrication
IDB	Industrial Development Board
IF	Fullerenes Like
ISO	International Organization for Standardization

LIB	Lithium Ion Batteries
LSSL	Limiting Shear Stress Lubrication
MEMs	Microelectromechanical System
ML	Mixed Lubrication
NEMs	Nanoelectomechanical System
NG	Nano Graphite
OEM	Original Equipment Manufacturers
PANI	Polyaniline
PAO	Poly Alpha Oifine
PEDOT	Polythylenedioxythiophene
PEG	Polyyetylene Glycol
PEM	Polymer Electrolyte Membrane
PFD	Process Flow Diagram
PSS	Polystyrensulfonate
SAE	Society of Automotive Engineers
SLINTEC	Sri Lanka Institute of Nanotechnology
SWNT	Single Wall Nano Tubes
TFL	Thin Film Lubrication
TRG	Thermal Reduced Graphene
UHV	Ultra High Vacuum
USGS	United States Geological Survey
UV	Ultra Violate
VI	Viscosity Index
ZDDP	Zincdialkyldithiophosphate

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