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โดยวิธีสกัดด้วยคลื่นไมโครเวฟ



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RECYCLING OF DEWATERED SLUDGES FROM ROLLING MILLS
BY MICROWAVE EXTRACTION

Miss Jittiporn Kulpisitthicharoen

A Thesis Submitted in Partial Fulfillment of the Requirements
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
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Accepted by the Graduate School, Chulalongkorn University in Partial
Fulfillment of the Requirements for the Master's Degree



.....Dean of Graduate School
(Professor Suchada Kiranandana, Ph.D.)

THESIS COMMITTEE


.....Chairman
(Assistant Professor Sutha Khaodhiar, Ph.D.)


.....Thesis Advisor
(Assistant Professor Suraphong Wattanachira, D.Eng.)


.....Member
(Assistant Professor Chavalit Ratanatamskul, Ph.D.)


.....Member
(Assistant Professor Prasert Pavasant, Ph.D.)

จิตติพร กุลพิลิตธิเจริญ : การนำสลัดจ์ที่ผ่านการรีดน้ำจากโรงงานผลิตเหล็กแผ่นกลับมาใช้ประโยชน์โดยวิธีการสกัดด้วยระบบคลื่นไมโครเวฟ (Recycle of Dewatered Sludge from Rolling Mills by Microwave Extraction) อ.ที่ปรึกษา : ผศ.ดร. สุรพงษ์ วัฒนะจิวะ, 138 หน้า ISBN 974-17-2632-5

สลัดจ์จากอุตสาหกรรมรีดเหล็กเป็นของเสียอุตสาหกรรมที่มีปัญหาประเภทหนึ่งและในประเทศไทยมีปริมาณเกิดขึ้นมากกว่า 20,000 ตันต่อปี สลัดจ์เหล่านี้มักได้รับการจัดการโดยวิธีการฝังกลบ การศึกษานี้มีวัตถุประสงค์เพื่อหาสภาวะที่เหมาะสมในการสกัดน้ำมันออกจากสลัดจ์ ที่ผ่านการรีดน้ำแล้วจากโรงงานผลิตเหล็กแผ่นแบบรีดร้อนและรีดเย็นเพื่อนำกลับมาใช้ประโยชน์โดยวิธีการสกัดด้วยระบบคลื่นไมโครเวฟ ภายใต้การโปรแกรมอุณหภูมิที่ 90, 120, และ 150 °C และใช้ตัวทำละลายต่างชนิดกัน เช่น อะซิโตน นอร์มัลเฮกเซน ปีโตรเลียมอีเธอร์ และสารละลายผสมระหว่างอะซิโตนและนอร์มัลเฮกเซน ในอัตราส่วน 1 ต่อ 1 โดยปริมาตร

ผลการศึกษาพบว่าสภาวะที่เหมาะสมสำหรับการสกัดน้ำมันออกจากสลัดจ์ที่ผ่านการรีดน้ำแล้วจากโรงงานผลิตเหล็กแผ่นทั้งแบบรีดร้อนและรีดเย็นอยู่ที่การโปรแกรมอุณหภูมิเท่ากับ 150 องศาเซลเซียสและใช้ตัวทำละลายที่เป็นสารละลายผสมระหว่างอะซิโตนกับนอร์มัลเฮกเซนในอัตราส่วน 1 ต่อ 1 โดยปริมาตร ซึ่งสามารถสกัดน้ำมันได้เฉลี่ย 28.83 เปอร์เซ็นต์ โดยน้ำหนักแห้งของสลัดจ์ และน้ำมันที่สกัดได้มีค่าความร้อนเฉลี่ยเท่ากับ 9,965 แคลอรีต่อกรัม ซึ่งเป็นค่าความร้อนของน้ำมันที่เหมาะสมและยอมรับสำหรับการใช้เป็นเชื้อเพลิงในโรงงานปูนซีเมนต์ได้ ส่วนกากของแข็งที่เหลือจากการสกัดประกอบด้วยเหล็กเฉลี่ยเท่ากับ 78.4 เปอร์เซ็นต์ และวัสดุอื่นๆ อีกเฉลี่ยเท่ากับ 21.6 เปอร์เซ็นต์ นอกจากนี้ยังพบว่าค่าใช้จ่ายที่ใช้ในการสกัดน้ำมันออกจากสลัดจ์ที่ผ่านการรีดน้ำแล้วจากโรงงานผลิตเหล็กแผ่นด้วยระบบคลื่นไมโครเวฟจากทุกการทดลองภายใต้สภาวะที่แตกต่างกันมีค่าอยู่ในช่วงระหว่างประมาณ 0.27 ถึง 8.01 บาทต่อกรัมของน้ำมันที่สกัดได้

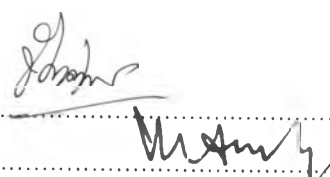
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ลายมือชื่อนิสิต.....

ลายมือชื่ออาจารย์ที่ปรึกษา.....



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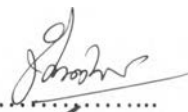
KEY WORK: SLUDGE/ ROLLING/ OIL/ MICROWAVE EXTRACTION/ RECYCLE/ HOT ROLL/ COLD ROLL


JITTIPORN KULPISITTHICHAROEN: RECYCLING OF DEWATERED SLUDGES FROM ROLLING MILLS WITH MICROWAVE EXTRACTION. THESIS ADVISOR: ASST. PROF. SURAPHONG WATTANACHIRA, D.Eng. 138 pp. ISBN 974-17-2632-5

Sludge from iron rolling mills is considered one of problematic industrial waste. In Thailand, the industrial rolling mill sludge is produced more than 20,000 metric tons per year and generally is disposed of in sanitary landfill. This research focused on recycling of dewatered sludge from hot and cold rolling mills by microwave extraction. The various temperature programming at 90, 120 and 150 °C and the different solvents such as acetone, N-hexane, petroleum ether and a mixture of acetone with N-hexane in 1:1 (volume/volume) ratio were studied in order to determine the optimum condition for oil extraction from dewatered sludge by microwave.

Based on the results from the study for both hot rolling mill and cold rolling mill cases, it was found that the average value of extracted oil of 28.83 % as dry sludge basis was obtained under the proper condition of microwave temperature programming at 150 °C and using the mixture of acetone and N-Hexane as extraction solvent. The average calorific value of 9,965 calories per gram of extracted oil which is acceptable for using as fuel in cement kiln was yield. Iron and other materials of 78.4 % and 21.6% by average, respectively, were the components of solid residue after extraction. Regarding the cost of oil extraction by microwave obtained from the entire experimental runs, it was varied between 0.27 and 8.01 Baht per gram of obtained extracted oil.

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Student's signature.....

Advisor's signature.....

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LIST OF ABBREVIATIONS

°C	=	Celsius degree
As	=	Arsenic
ASTM	=	American Society for Testing and Materials
BaCl ₂	=	Barium Chloride
BaSO ₄	=	Barium Sulphate
BTU	=	British thermal unit
Cal/g	=	Calorie per gram
Cd	=	Cadmium
Cr	=	Chromium
Cu	=	Copper
Fe(OH) ₂	=	Iron Hydroxide
Fe ₂ O ₃	=	Iron Oxide
Hg	=	Mercury
Ni	=	Nickel
Pb	=	Lead
ppm	=	Part per million
SSI	=	Sahaviriya Steel Industry Public Company Limited
SSM	=	Siam Strip Mill Public Company Limited
SUS	=	Siam United Steel Company Limited
TCRSS	=	Thai Cold Roll Steel Sheet Company Limited
T-Fe	=	Total Iron
Tl	=	Telenium
V	=	Vanadium
XRF	=	X-Ray Fluorescence
Zn	=	Zinc