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HEAT TREATMENT BEHAVIOUR OF MULTI-COMPONENT WHITE CAST IRON
FOR COLD WORK ROLL

Miss Wanaporn Khanitnantharak

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Engineering in Metallurgical Engineering

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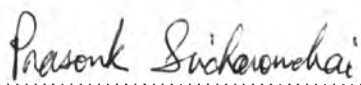
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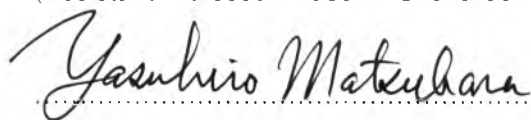
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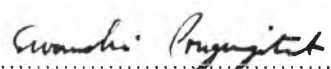

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ได้เตรียมเหล็กหล่อขาวธาตุผสมหลายชนิด ซึ่งมีปริมาณส่วนผสมโดยประมาณของ โครเมียมและโมลิบดีนัมร้อยละ 5 โดยมวล, วาเนเดียม ร้อยละ 1 - 3 และคาร์บอน ร้อยละ 0.5 - 1.5 เพื่อใช้ศึกษาความสัมพันธ์ระหว่างพฤติกรรมการเปลี่ยนแปลงโครงสร้าง สภาพการอบชุบ ความร้อนและส่วนผสมทางเคมีของธาตุผสมต่างๆ ผลการทดลองพบว่ายูเทคติกของคาร์ไบด์ MC และ M_2C ตกตะกอนในชิ้นงานทดสอบทุกชิ้น ความแข็งแรงภาคแปรเปลี่ยนได้อย่างมากขึ้น กับความแข็งของมาร์เทนไซต์และสัดส่วนเชิงปริมาตรของออสเทนไนท์เหลือค้าง (V_γ) แม้ว่า ความแข็งของชิ้นงานในสภาพภายหลังการชุบแข็งไม่เปลี่ยนแปลงไปในทางที่สอดคล้องกับการ เปลี่ยนแปลงส่วนผสมทางเคมี แต่สัดส่วนเชิงปริมาตรของออสเทนไนท์เหลือค้างลดลงเมื่อ ปริมาณวาเนเดียมเพิ่มขึ้น และเพิ่มขึ้นเมื่อปริมาณคาร์บอนและอุณหภูมิทำให้เป็นออสเทนไนท์ เพิ่มขึ้น กราฟของความแข็งชิ้นงานในสภาพหลังการอบคืนตัวแสดงการเกิด Secondary Hardening เนื่องจากการตกตะกอนของคาร์ไบด์ชนิดพิเศษดังที่เรียกกันว่าปฏิกิริยาการอบคืน ตัว (Tempering Reaction) และค่าความแข็งภายหลังการอบคืนตัวสูงสุด (H_{Tmax}) เกิดขึ้นที่ อุณหภูมิการอบคืนตัวจาก 773 K ถึง 873 K ค่าความแข็งสูงสุดของชิ้นงานภายหลังการอบคืน ตัวเกิดขึ้นเมื่อปริมาณออสเทนไนท์เหลือค้างมีค่าเท่ากับร้อยละ 30 โดยไม่คำนึงถึงอุณหภูมิทำให้เป็นออสเทนไนท์ นอกจากนี้ยังพบว่าพฤติกรรมของความแข็งและปริมาณออสเทนไนท์เหลือ ค้างสามารถอธิบายสอดคล้องกับพารามิเตอร์ที่เรียกว่า Carbon Balance

ภาควิชา.....วิศวกรรมโลหการ.....ลายมือชื่อนิสิต.....
 สาขาวิชา.....วิศวกรรมโลหการ.....ลายมือชื่ออาจารย์ที่ปรึกษา.....
 ปีการศึกษา.....2543.....ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....


 Yasuhiro Matsubara

4170495721 : MAJOR METALLURGICAL ENGINEERING

KEYWORD : MULTI-COMPONENT WHITE CAST IRON / SECONDARY HARDENING

WANAPORN KHANITNANTHARAK : HEAT TREATMENT BEHAVIOUR OF MULTI-COMPONENT WHITE CAST IRON FOR COLD WORK ROLL. THESIS ADVISOR : ASSISTANT PROFESSOR PRASONK SRICHAROENCHAI, THESIS CO-ADVISOR : PROFESSOR YASUHIRO MATSUBARA, 110 pp. ISBN 974-347-010-7.

Multi-component white cast irons containing about 5 mass% each of Cr and Mo, 1-3%V and 0.5-1.5%C were prepared to investigate the relationships among transformation behavior, heat-treating condition and chemical composition of the cast irons. It was found that the eutectic MC and M_2C carbides precipitated in all specimens. Macro-hardness of the cast iron varied widely by the hardness of martensite itself and the volume fraction of retained austenite (V_γ). Though the hardness does not change evenly according to the change in chemical composition, in as-hardened state the V_γ decreases as V content increases and it increases as C content and austenitizing temperature rise. The curves of tempered hardness showed the secondary hardening due to the precipitation of special carbides by so-called tempering reaction. The maximum values of tempered hardness (H_{Tmax}) were obtained at the tempering temperatures from 773 K to 873 K. The highest value of hardness in the tempered specimens was shown regardless of austenitizing temperature when the V_γ in as-hardened state is 30%. It was also found that the behavior of hardness and V_γ were successfully explained by a parameter of the carbon balance.

Department.....Metallurgical Engineering.....Student's signature.....*Wanaporn Khanitnantharak*
 Field of study...Metallurgical Engineering.....Advisor's signature.....*Prasonk Sricharoenchai*
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