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จุฬาลงกรณ์มหาวิทยาลัย

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THERMAL ENHANCEMENT OF SOME BLUE SAPPHIRES
FROM MADAGASCAR



Miss Somruedee Sakkaravej

ศูนย์วิทยทรัพยากร

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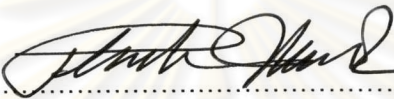
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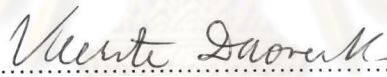
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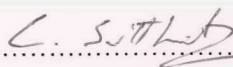
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การปรับปรุงคุณภาพพลอยคอรัันดัมด้วยความร้อนหรือการเผาพลอยเป็นกรรมวิธี
เพิ่มคุณภาพที่สำคัญอันเป็นที่รู้จักและยอมรับในตลาดการค้าระหว่างประเทศ ปัจจัยสำคัญของการ
ปรับปรุงคุณภาพพลอยด้วยความร้อน ได้แก่ อุณหภูมิ เวลา อัตราการเพิ่มและลดของอุณหภูมิ และ
สภาวะที่การเผา นอกจากนี้ธรรมชาติ และลักษณะเฉพาะของพลอยก็นับเป็นปัจจัยที่ต้องคำนึงถึงใน
กระบวนการปรับปรุงคุณภาพพลอยด้วยความร้อนเช่นกัน

ตัวอย่างพลอยแชปไฟร์ จากแหล่งอิลากากา-ซาคาราซา ซึ่งอยู่ทางตะวันตกเฉียงใต้
ของประเทศมาดากัสการ์ สามารถจัดแบ่งเป็นกลุ่มสีต่างๆ ตามความแตกต่างของสีได้ 7 กลุ่ม คือ
กลุ่มสีน้ำเงินเข้ม น้ำเงินปานกลาง น้ำเงินอ่อน ฟ้ำชุ่น ม่วงเข้ม ม่วงปานกลาง และม่วงอ่อน
การศึกษาสมบัติทางกายภาพและสมบัติทางแสงโดยเครื่องมือตรวจสอบอัญมณีพื้นฐาน และ
เครื่องมือขั้นสูง การทดลองเผาในสภาวะรีดิวิซิง อุณหภูมิสูงสุดในการทดลองเผาตั้งแต่ 1000 °ซ,
1200 °ซ, 1400 °ซ และ 1650 °ซ โดยคงอุณหภูมิสูงสุดเป็นเวลา 3 ชั่วโมง และดำเนินการตรวจสอบ
สมบัติของตัวอย่างทุกตัวอย่างหลังการเผาทุกขั้นตอน ผลการศึกษาพบว่าช่วงอุณหภูมิที่เหมาะสมใน
การเพิ่มความเข้มของสีน้ำเงินของพลอยแชปไฟร์ส่วนใหญ่อยู่ระหว่าง 1400 °ซ และ 1650 °ซ
อย่างไรก็ตาม มีบางตัวอย่างที่สีหายไปภายหลังจากทดลองเผาที่อุณหภูมิสูง ซึ่งการเปลี่ยนแปลงสี
ดังกล่าวมีความสัมพันธ์อย่างชัดเจนกับอัตราส่วนระหว่าง Fe : Ti : Mg ซึ่งเป็นองค์ประกอบในพลอย
นอกจากนี้พลอยแชปไฟร์ที่มีปรากฏการณ์การเปลี่ยนสีไม่เหมาะสมกับการเผาเนื่องจากจะสูญเสีย
ปรากฏการณ์ที่มีค่าดังกล่าว โดยสรุปพลอยแชปไฟร์จากอิลากากา-ซาคาราซา มีศักยภาพในการเพิ่ม
คุณภาพด้วยความร้อน อย่างไรก็ตามในการดำเนินการจะต้องใช้ความระมัดระวังอย่างสูงในบาง
กรณี

ภาควิชา.....ธรณีวิทยา.....ลายมือชื่อนิสิต.....
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SOMRUEDEE SAKKARAVEJ: THERMAL ENHANCEMENT OF SOME BLUE SAPPHIRES FROM MADAGASCAR
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 THESIS CO-ADVISOR: ASSOCIATE PROFESSOR VISUT PISUTHA-ARNOND, PH.D.,
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Heat treatment is the most conventional method for gem enhancement. Color and clarity improved from this process are accepted by the international trading organizations as a general disclosure as long as there has been no color chromoproric causing element diffusing from an external source. Significant factors for the heat treatment are the maximum temperature reach, soaking time, heating rate, cooling rate and environmental condition. However, some intrinsic characteristics of those material stones (for example its characteristic trace element content which may appear as milky zone) are the most crucial concern for all burners.

Some blue sapphires from Ilakaka-Sakaraha deposits, southwestern Madagascar were collected for this study; they were subsequently categorized into 7 color groups (e.g. dark blue, medium blue, very light blue, milky very light blue, dark violet, medium violet and light violet). Determination of physical and optical properties of raw sapphire samples were carried out using basic equipments and advanced instruments. Step-heating treatments under reducing condition using an electric furnace were carried out of different highest temperatures (1000°C, 1200°C, 1400 °C and 1650 °C). Three hours soaking time were used during experiment. Characteristics of all samples were then examined again after each heating step. Results of this study clearly indicate that most sapphires can be intensified their blue colors at 1,400 °C – 1,650 °C; however, some sapphires turn colorless at high temperature. These appearances can be conclusively explained by Fe : Ti : Mg ratio contained in sapphire samples. In addition, sapphires with color-change effect are not recommended for heat treatment, because they appear to have lost this valuable phenomena. In conclusion, Ilakaka-Sakaraha sapphires have a potential for thermal enhancement; however, great care must be taken for particular cases.

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Field of study.....Earth SciencesAdvisor's signature.....*C. Suthirat*

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