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THE MINERALOGICAL STUDY OF HEAVY MINERALS  
FROM TIN-MINES IN KATHU VALLEY, CHANGWAT PHUKET

Ms. Wilawan Phetwaroon

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science

Department of Geology

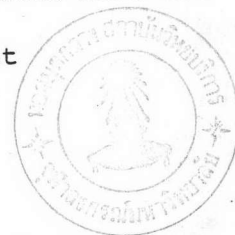
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หัวข้อวิทยานิพนธ์	การศึกษาเชิงแร่วิทยาของแร่หนักจากเหมืองดีบุกบริเวณ หุบกะทู้ จังหวัดภูเก็ต
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#### บทคัดย่อ

หุบกะทู้ตั้งอยู่ในบริเวณตอนกลางของเกาะภูเก็ต ครอบคลุมพื้นที่ประมาณ ๑๐ ตารางกิโลเมตร ผลผลิตของแร่ดีบุกจากจังหวัดภูเก็ตประมาณ ๖๕ เพอร์เซ็นต์มาจากเหมืองแร่ในบริเวณหุบกะทู้และพื้นที่ข้างเคียง นอกจากนี้ยังมีแร่หนักอื่น ๆ เกิดสะสมตัวร่วมกับแร่ดีบุกในแหล่งของพื้นที่ดังกล่าวอีกด้วย

วัตถุประสงค์ของการศึกษาคือการวิเคราะห์ตรวจสอบและสำรวจการกำเนิดร่วมของแร่หนักจากตัวอย่างที่ได้มาจากเหมืองแร่ดีบุกจำนวน ๑๕ เหมืองในพื้นที่หุบกะทู้และบริเวณข้างเคียง ทั้งนี้ได้เป็นการศึกษาในด้านคุณสมบัติทางกายภาพของแร่หนักแต่ละชนิด การกระจายตัวของขนาดเม็ดแร่ ความสมบูรณ์ของแร่และความสัมพันธ์ระหว่างองค์ประกอบดังกล่าว นอกจากนี้ได้ดำเนินการศึกษาสภาพธรณีวิทยาของบริเวณที่เก็บตัวอย่างโดยละเอียดเป็นการเพิ่มเติมเพื่อที่จะช่วยให้การตีความหมายของชุดแร่หนักที่เกิดร่วมกันในด้านที่เกี่ยวข้องกับการกำเนิดสามารถกระทำได้ดียิ่งขึ้น

แร่หนักที่พบทั่วไปในบริเวณเหมืองดีบุก ๔ แห่ง ภายในพื้นที่หุบกะทู้คือ แคลสซิเทอไรต์ แคลสซิเทอไรต์ที่มีแมงกานีสเคลือบ แคลสซิเทอไรต์ที่มีผลึกงอกประสานกับแร่ควอร์ตซ์ การ์เน็ต อิล-เมไนต์ แมงกานีสออกไซด์ โมนาไซต์ ซิโนไทม์ ไมกา ทัวร์มาลีน และเซอร์คอน แร่หนักที่พบในปริมาณมากที่สุดคือ แคลสซิเทอไรต์ แคลสซิเทอไรต์ที่มีแมงกานีสเคลือบและแคลสซิเทอไรต์ที่มีผลึกงอกประสานกับแร่ควอร์ตซ์ ส่วนแร่หนักอื่น ๆ ที่พบร่วมในปริมาณน้อยคือ เหล็กออกไซด์ รูไทล์ สปิเนล โทแพซ วุลแฟรมไมต์ โคลัมไบต์-แทนทาลไลต์ แมงกาน-แทนทาลไลต์ แอลลาไนต์ อะพาไทต์ จูโคซิน ไลมโอนต์ ฮีเดอไรต์ มัลดีเปิลออกไซด์ ที่มีธาตุโคลัมเบียม-แทนทาลัม และแมกนีไทต์ ลักษณะการเกิดร่วมของชุดแร่หนักโดยทั่วไป จากเหมืองแร่ดีบุกในบริเวณพื้นที่นอกหุบมีลักษณะละลายคล้ายคลึงกับลักษณะที่พบภายในหุบ ข้อแตกต่างที่สำคัญคือพบแร่บางชนิดในบางพื้นที่ภายนอกหุบกะทู้เท่านั้น

เช่น ฮีมาไทต์ ไฟไรต์ ซีเตอไรต์ ทอไรต์ ฟลูออไรต์ ซีไลต์ อาร์เซโนไฟไรต์ และไฟไรต์ที่ถูกเปลี่ยนแปลง แร่แคลซิเทอไรต์ที่มีแมงกานีสเคลือบจะปรากฏ เฉพาะพื้นที่ภายในบริเวณหุบเท่านั้น

นอกจากนี้ได้ทำการศึกษาเพิ่มเติมเกี่ยวกับความสัมพันธ์ระหว่างองค์ประกอบหลายประการของขนาดเม็ดแร่ดีบุกกับแร่หนักอื่น ๆ ในส่วนที่เกี่ยวข้องกับค่ามัชฌิม ค่ามัธยฐาน และค่าคัดขนาด นอกจากนี้ยังได้ทำการศึกษาลักษณะการแปรเปลี่ยนของปริมาณแร่หนักแต่ละชนิดกับองค์ประกอบหลายประการของขนาดเม็ดแร่ ความสนใจเกี่ยวกับแร่เชิงเศรษฐกิจบางชนิดได้รับการพิจารณา ดำเนินการเป็นกรณีพิเศษได้แก่ แคลซิเทอไรต์ โคลัมไบต์-แทนทาลไลต์ โคลัมเบียม-แทนทาลัม (สตรูเวอไรต์) เซอร์คอน โมนาไซต์ ซีโนไทม์และฮิลเมไนต์

ท้ายที่สุดลักษณะของแร่หนักรวมทั้งความสัมพันธ์ระหว่างองค์ประกอบด้านต่าง ๆ ของแร่หนักได้รับการพิจารณาเข้ามาร่วมใช้อธิบายการกำเนิดของแหล่งแร่หนัก ทั้งในพื้นที่หุบกะทู้ และบริเวณข้างเคียง ข้อค้นพบจากการศึกษาครั้งนี้อาจนำไปประยุกต์ใช้ได้กับเรื่องที่มีความสำคัญด้านอื่น ๆ อาทิเช่น การประเมินศักยภาพของแหล่งแร่หนัก การออกแบบและการพัฒนากรรมวิธีการทำเหมืองแร่ กรรมวิธีการแต่งแร่ การสำรวจแหล่งแร่หนัก ฯลฯ ได้อีกด้วย

Thesis Title        The Mineralogical Study of Heavy Minerals from Tin  
 Mines in Kathu Valley, Changwat Phuket

Name                Ms.Wilawan Phetwaroon

Thesis Advisor     Assistant Professor Chaiyudh Khantaprab, Ph.D.

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#### ABSTRACT

Kathu Valley is located in the central part of Phuket Island covering an area of approximately 10 square kilometres. About sixty-five per cent of the total tin-concentrate production of Phuket comes from existing tin-mines in Kathu Valley and neighbouring area. Besides, there are a variety of detrital heavy minerals associated with cassiterite deposit in this area.

The purpose of the present investigation is to study the heavy mineral associations of fifteen tin-mines in Kathu Valley and neighbouring area. Particular emphases have been given to the physical properties of each mineral, grain size distribution, degree of abundance, and their interrelationships. In addition, the detailed geological setting of each sampling location has been conducted to facilitate the interpretation of heavy mineral suites particularly regarding to their genesis.

The common heavy minerals of eight tin-mines within Kathu Valley are cassiterite, cassiterite with manganese coat, cassiterite interlocking with quartz, garnet, ilmenite, manganese oxide, monazite, xenotime, mica, tourmaline and zircon. The most abundant heavy minerals are cassiterite including cassiterite with manganese coat and cassi-

terite interlocking with quartz. Other accessory minerals are Fe-oxide, rutile, spinel, topaz, wolframite, columbite-tantalite, mangan-tantalite, allanite, apatite, leucoxene, limonite, struverite, multiple oxide containing Nb-Ta, and magnetite. The nature and characteristics of heavy mineral assemblages from seven tin-mines outside the Valley are generally fairly similar to those within the Valley. The main differences are some minerals which are found only in some localities outside the Valley, namely, hematite, pyrite, siderite, thorite, fluorite, scheelite, arsenopyrite and altered pyrite. The only variety of cassiterite with manganese coat is present only in Kathu Valley.

Additional attempts have been made to determine the relationships between grain size parameters of cassiterite against other heavy minerals in terms of mean, median and sorting. Moreover, the variation of relative degree of abundance of heavy minerals with respect to grain size characteristics has been studied. Special attention has also been paid on the distribution patterns of some economically important heavy minerals: cassiterite, columbite-tantalite, columbium-tantalum (struverite), zircon, monazite, xenotime and ilmenite.

Finally, the characteristics of heavy minerals including the interrelationships between their numerous parameters have been explained in the light of their genesis for Kathu Valley and neighbouring area. The findings of the present investigation can be applied to many other important aspects, notably, the determination of potential heavy mineral resources, the design and development of appropriate ore dressing technique, the exploration of heavy minerals, etc.



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