CHAPTER I

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1.1 General

Thailand is one of the world major tin producing countries, the fourth from Malaysia, Indonesia and Bolivia, respectively excluding centrally-planned economy countries, during the last decade. Her production output was peaked at 40,000 tonnes in 1979 (approximately 20% share of the world tin supply), has continuously declined to around 30,000 tonnes in 1981 (15.4% of the world production), to around 18,000 tonnes in 1983 (15.5% of the world production) and about the same level in 1984 (Lay, 1985). Consequently Thailand has earned more than 9 billion baht in the last 25 years of her tin exporting history. According to the Custom Department statistics, the value of exported tin was accounted for some 3% of all the major exporting goods from Thailand in 1984.

Despite, her role as one of the world's major tin producers, detailed geological studies on the tin deposits in Thailand are still scarce. Only few detailed studies, however, are available and are concerned for the most part on the associated granitic rocks (Aranyakanon, 1961; Beckinsale et al., 1979; Pitragool and Panupaisal, 1979; Punyaprasiddhi, 1980; Mahawat, 1982; Norman and Trangcotchasan, 1982; Hansawek, 1983; Nakapadungrat, 1982; Puttapiban and Gray, 1983; Pungrassami, 1984; Jackson and Helgeson, 1985 a).

The scarcity in the detailed geological investigation particularly on the tin mineralization itself may primarily due to the fact that most of the tin production in Thailand are predominantly from secondary alluvial and eluvial deposits (i.e., approximately 85% of the Thailand tin production in the last five years came from the secondary tin deposits both onshore and offshore). Nevertheless tin production from primary deposits is markedly on the rise (from 9% share in 1980 to 16% in 1984). Statistically, therefore, exploitation of primary tin deposits begins to play a more important role in the Thailand tin mining industry, even though the recent collapse of the international tin market has slowed down the future prospect considerably. Understanding of the nature of primary tin deposit is inevitably neccessary in the future tin exploration and mining development.

The primary tin and associated tungsten deposits in Thailand which are located in the South-East Asian tin belt have been reviewed by Aranyakanon (1969), Hosking (1970), Tantisukrit (1978), Vichit (1983) and Charoensri (1983). Among different types of primary tin deposits in Thailand referred earlier, the tin-sulfide deposit is the least known. Only a brief description on the geology and mineralogy on the tin-sulfide deposits at Pinyoh mine and at Tam Talu mine in the southern Thailand is available (Aranyakanon 1969; Hosking, 1970; Hosking, 1981). Therefore the detailed study on geology and mineralogy as well as mineralization on the cassiterite-sulfide ore at Takua Pit Thong mine will be the first of its kind ever carried out in Thailand.

1.2 Location and Accessibility

The Takua Pit Thong mine is situated about 205 km. west of Bangkok and very close to Thai-Burmese border (Figure 1). The mine and adjacent area selected for this study cover approximately 10 square kilometers which is located between the latitude 13^{o} 39' 35"-13^{o} 41' 45" N and longitude 90^{o} 10' 16" - 99^{o} 11' 40" E of the topographic map scale 1:50,000, sheet number 4836 III, series L 7017 of Muang Thung Chedi.

The accessibility to the study area is fairly good (Figure 2). It took around $4\frac{1}{2}$ hour drive from Bangkok to the mine via No.4 highway to reach Changwat Ratchaburi, No.3087 road to Amphoe Suan Phung and small dirt road approximately 30 kilometers from Amphoe Suan Phung northwestwards and up hill to the mine. It should also be noted that the dirt road to the mine may be hazardous during the rainy season.

1.3 Mining History

The Takua Pit Thong mine was named after the main stream valley, so called Huai Takua Pit Thong, that runs through the mining area. The mine is owned and operated by Laem Pichai Mining Co. Ltd. The mine activities at the Takua Pit Thong area began in 1971. During that time, cassiterite in placer deposits was the main target of exploitation. The mining technique was mainly by means of gravel pumping onto the palongs and jigs. Separation of different kinds of heavy minerals was subsequently carried out in the ore-dressing plant using hydrocyclone, magnetic separator, and high tension separator. Since 1982, when the presence of primary cassiterite-sulfide ores

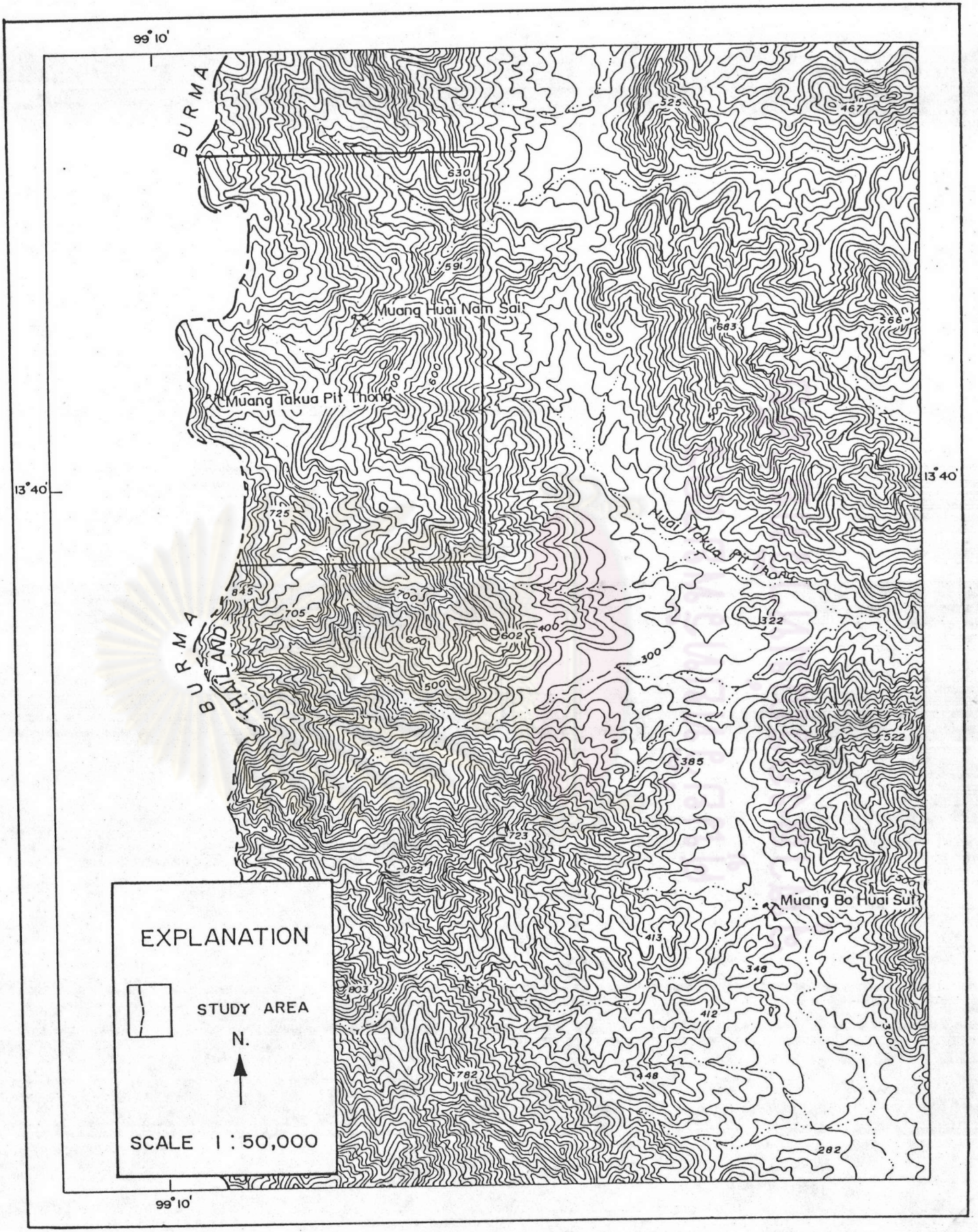

Figure 1 Topographic map showing the location of Takua Pit Thong area.

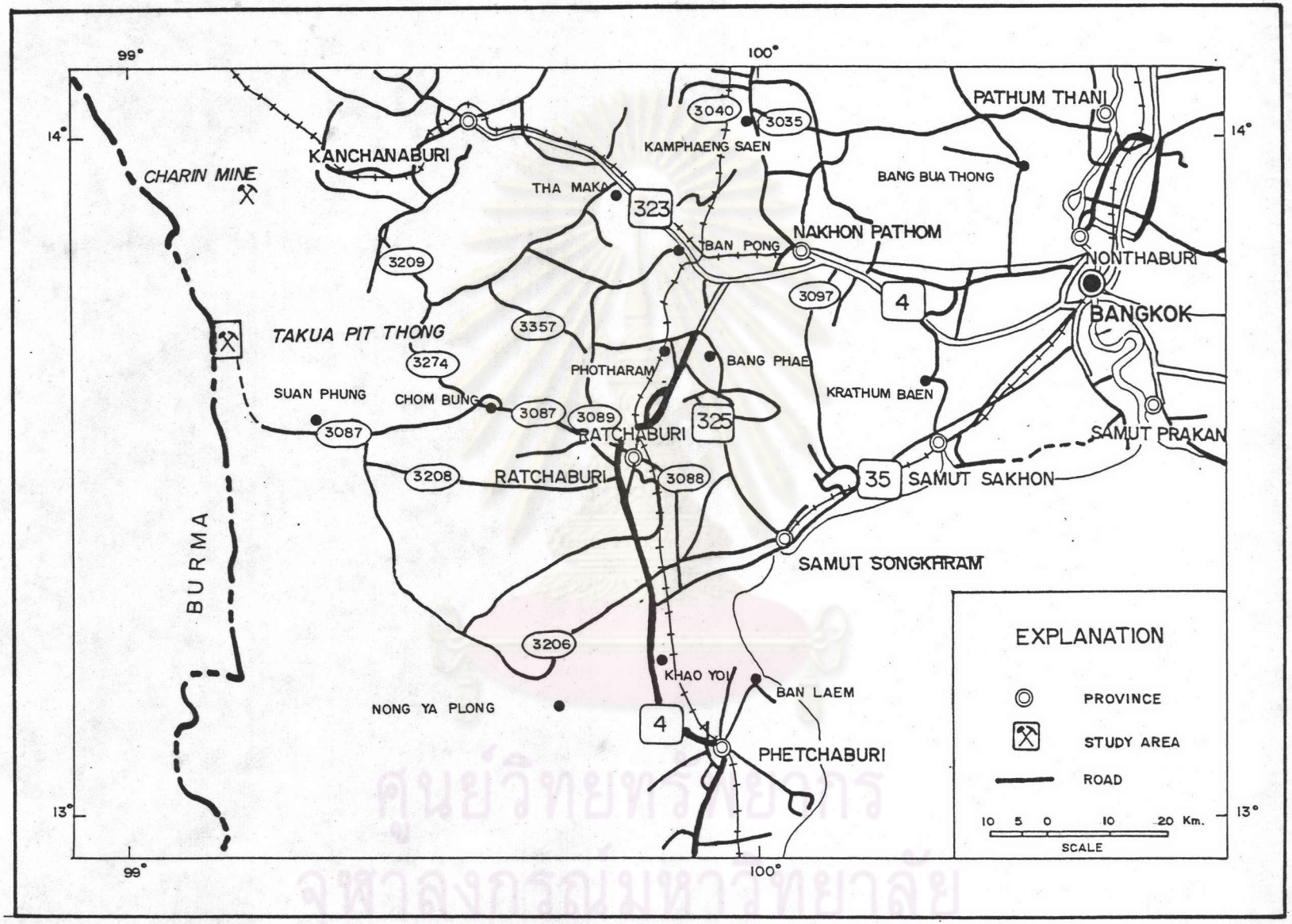

Figure 2 Map showing the access to the Takua Pit Thong mine, Amphoe Suen Phung, Ratchaburi.

was first discovered, the deposit was mined by open cast method. Dressing plant for cassiterite-sulfide ore was installed shortly but has not been in the operation ever since because of the unfavorable quota system. The production from Takua Pit Thong mine is limitted by the quota system set by the Department of Mineral Resources at about 7 metric tonnes per month of cassiterite (average grade of 72% SnO_2) with scheelite as the main by product.

1.4 Previous Works

The first published report related to the studied area was by Brown, et al. (1953). A brief description on the secondary tin deposits at Takua Pit Thong area which was grouped into the Ratchaburi-Kanchanaburi Tin Province was mentioned in the report.

Subsequently, a reconnaissance geological study and geologic map on the 1:15,000 scale covered the mining area was made by Chancharoonpong (1970). He concluded that the secondary tin deposit might be derived from pegmatite veins crosscutting the granitic rocks in this area. He further suggested that the area of high potential for tin mineralization was along the igneous contact zone but he has failed to recognize the presence of primary cassiterite-sulfide ore in the area.

A more detailed geologic map of the area on the scale 1:12,500 was later done by Nutalaya (1972). The locations of major and minor secondary tin deposits were also included in that map.

In 1981, Dheeradilok compiled a regional geologic map of the Changwat Nakon Pathom map sheet on the scale 1:250,000 (ND 47-11).

According to this map, the area west of Amphoe Suan Phung especially along Thai-Burmese border was underlain mostly by Jurassic-Cretaceous? granitic plutons.

Olanratmanee et al.(1983) carried out a geophysical survey by using proton magnetometer covering the mine area about 0.59 square kilometers. The aim of that survey was to locate other undiscovered cassiterite-sulfide ore. The total surveying distance was 29.995 km with 6,102 surveying points. The result from this survey revealed that the magnetic anomalies were detected only at the locations where there presently has been mined by ground slucing and open-cast of the exposed-cassiterite-sulfide ores. The anomaly, however, has not been detected in the other soil-covered area in this investigation. Subsequently, a geologic map on the scale 1:15,000 covering the Takua Pit Thong mine and adjacent area was made (Olanratmanee et al., 1983). Two types of primary cassiterite deposits, namely, pegmatite veins and cassiterite-sulfide orebodies along the contact zone between granitic and carbonate country rocks were briefy outlined.

1.5 Purposes and Methods of Study

Eventhough a number of reports related to the Takua Pit Thong mine and adjacent area are available or published, most of those reports are essentially a reconnaissance in nature. No detailed study on the geology and mineralization as well as the nature of granitic and country rocks has been carried out.

Therefore the purposes of this study are firstly to compile and make a more detailed geologic mapping of the Takua Pit Thong area. Secondly, the nature of cassiterite-sulfide mineralization is

determined in terms of mineral assemblages, textural relationship and paragenesis. And thirdly, the chemical characteristics of the associated granitic rocks in the area are investigated with respect to major oxides and trace element contents.

The techniques used in this investigation include mainly petrographic and ore microscopic examinations of thin sections and polished sections of rocks and ore samples with the aid of X-ray Diffractometry whenever neccessary. A total of 165 thin sections of granitic, country rocks and ore samples and 75 polished sections of opaque ore minerals were made in this investigation. All major element-oxides and trace element contents in the granitic rocks were carried out by X-ray Fluorescence method using Phillips (P.W. 1400) automatic X-ray spectrometer attached with computerized system. The FeO content was analyzed by volumetric method. The H_2O^+ determination was carried out by modified Penfield technique. These elements were analyzed by the staffs of Analytical Laboratory Section, Geological Survey Division, Department of Mineral Resources. Detailed procedures on each of these techniques are described in Appendix.

It is anticipated that the results from this study will help in terms of ore beneficiation and are able to put some light on the characteristic and genesis of this type of cassiterite-sulfide deposits and on what control the mineralization. This will certainly be a great value to be used as a model for future exploration of the similar types of mineralization elsewhere.