

## Geological Study of Oil Sand from Lower Mae Sot Formation, Fang Basin, Changwat Chiang Mai

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### Abstract

This study concentrates on investigating the geochemical and petrological characteristics of oil sand in Mae Sot Formation, in Fang District, Chiang Mai province for assessing its potential as energy resource. Oil sand geochemistry data can be used in correlation with oils produced from Fang basin. Data from this study will be useful for further exploration planning in Fang basin.

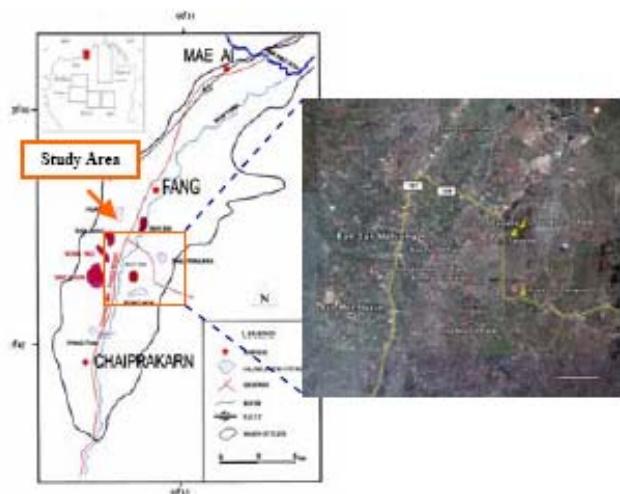
**Keywords:** oil sand; Mae Sot Formation; Fang basin

### 1. Introduction

Over the past decade the petroleum industry has increasingly recognized that hydrocarbon production because of the industrial needs will continue to use energy from fossil fuel until new clean and economical energies can replace them. At the present time, the petroleum is increasingly used for many purposes. Most of the petroleum production in Thailand has been obtained from Tertiary basins. Therefore, numerous exploration programs have been planned and executed in these basins.

The Fang basin (Fig.1), one of the Tertiary basins, is located in the northern part of Chiang Mai province, Northern Thailand. There has been explorations and production of petroleum in the Fang basin for 53 years. Although the petroleum reserve in this basin is not significant, increased production from this basin can help to decrease the petroleum imports in Thailand. Many countries have started to look for alternative energy sources, such as oil sand. More than 30 countries worldwide reported oil sands in their countries. The estimated value of oil sand reserve is much more than the conventional oil reserves known. However, the production of petroleum

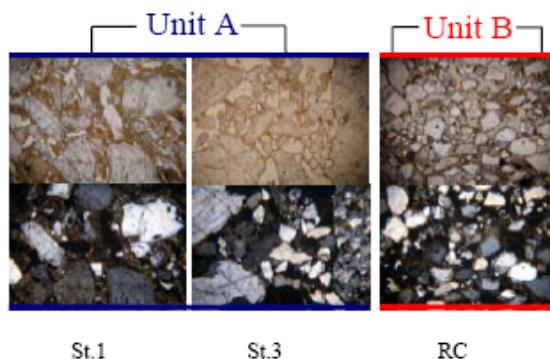
from oil sand being more complicated and difficult than conventional oil production, oil sand has been so far overlooked in Thailand. The Exploration and Production Division, Northern Petroleum Development Centre reported that oil sand is found Mae Sot Formation but there has been no detailed study of oil sand in the Fang basin.



**Figure 1:** Study area, the Eastern of Fang basin, Changwat Chiang Mai, Thailand

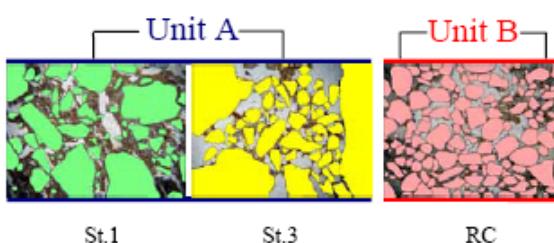
## 2. Experimental Results and Discussion

The lithology and geochemical characteristics including detailed petrography of three oil sand samples and two crude oils from Fang Basin are described in this research paper. These characteristics from laboratory indicate that the oil sand can be divided into two units. (Fig.2)



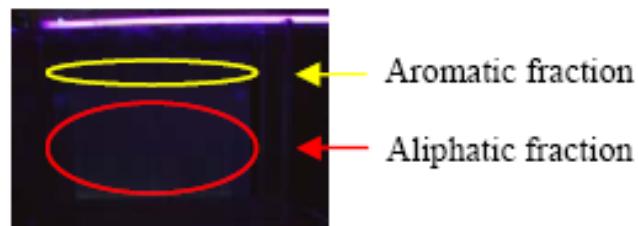
**Figure 2:** Petrographical characteristic of oil sand in Fang basin.

Unit A is dominated by very poorly sorted fine to coarse sandstone having about 90-92% quartz and about 8-10% rock fragments, with sub-angular to sub-rounded grains. Unit B sandstone consists of well sorted fine to medium grained sandstone with subrounded to rounded grains having 93-95% quartz and 5-7% rock fragments. The porosity of Unit A is about 40% and the porosity of Unit B is about 30% of the rock volume (Fig.3).



**Figure 3:** Determination of porosity using Arcview program.

In geochemistry laboratory, the bitumen from extracted oil sand and crude oil was separated using TLC method (Fig.4). After that, each fraction was analyzed by Gas Chromatography Mass Spectrometer (GC-MS) for understanding the geochemistry. Source rock of PN and BR crude oils were deposited under oxic condition with varying amount of terrestrial organic input. Source rocks for oils that seep into St.1 and St.3 oil sand were deposited under anoxic conditions. Source rocks for oils that seep into RC oil sand can be deposited under oxic conditions similar to those of PN and BR crude oil (shown by  $\text{Pr}/\text{Ph}$  ratios,  $\text{Pr}/n\text{C}17$  and  $\text{Ph}/n\text{C}18$  and  $\text{Ts}/(\text{Ts}+\text{Tm})$  ratios).



**Figure 4:** Thin layer chromatography method applied for hydrocarbon analysis.

## 3. Discussion and Conclusion

The depositional environments may be showing a change from lacustrine into floodplain and channels, characterized mainly by poorly sorted deposits of the Mae Fang Formation in Unit A and well-sorted deposits of Mae Sot Formation in Unit B. The high porosity value may have been caused by released feldspar grains.

## 4. Acknowledgement

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