

The Application of Light Hydrocarbons Technique to Petroleum Exploration in Northwestern Taiwan

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Abstract

The purpose of this study was to examine the potential of C_7 light hydrocarbons as biomarkers for petroleum exploration. The oil and condensate reservoirs of the sedimentary basins in northwestern Taiwan generally are in the deltaic–littoral–neritic sandstones of Upper Oligocene to Upper Miocene strata. The use of this technique as a qualitative tool shows that all the oils from the northwestern Taiwan were mature, free of biodegradation, affected by evaporative fractionation and derived from the same petroleum system. The source rock of the oils should be terrigenous.

Introduction

The major petroleum region of Taiwan is situated in north western Taiwan and is believed to contain several trillion cubic feet of gases, as well as substantial amounts of oils and condensates. The sedimentary basins in the onshore and offshore western region of Taiwan were formed on the passive continental margin in eastern Asia, from the Late Cretaceous to Tertiary Periods. The basins include several fault-bound basins separated by rift horsts. The production of oil and condensate is concentrated in the foothill belt of the onshore Hsinchu–Miaoli region (Fig.1). This region is characterized by anticlinal structures parallel to the Central Taiwan Mountain Ranges, striking in a NE-SW direction. Even though oil and condensate production is predominately derived from quartzose sandstones of Early Miocene formation, the oil reservoirs in the sedimentary basins in north western Taiwan are generally sourced from deltaic-littoral-neritic sandstones in the Upper Oligocene to Upper Miocene strata. In the oil fields, reservoirs range in depth from 300 to over 5000m. Since the oils and condensates are produced from the Late Oligocene-Middle Miocene sandstones, the potential source rocks in the available sample collection mostly contain gas-prone, type III organic matter.

Gasoline range hydrocarbons, such as C_7 compounds, have been widely utilized in petroleum geochemistry studies. These compounds have been used to determine oil groups derived from the same source rock, to predict maturity and to identify alteration of crude oils due to water washing, bio-degradation or evaporative fractionation. Since condensates or light oils have very low concentrations of the C_{15+} fraction, correlation to source rocks, using these biomarkers, was found to be

problematic. In such cases, light hydrocarbons derived from source rocks were found to be useful in correlating source rocks to condensates and black oils and the origin of light hydrocarbon the in same oil system. Light hydrocarbons were also used to determine the degree of thermal maturity in the oil system.

References

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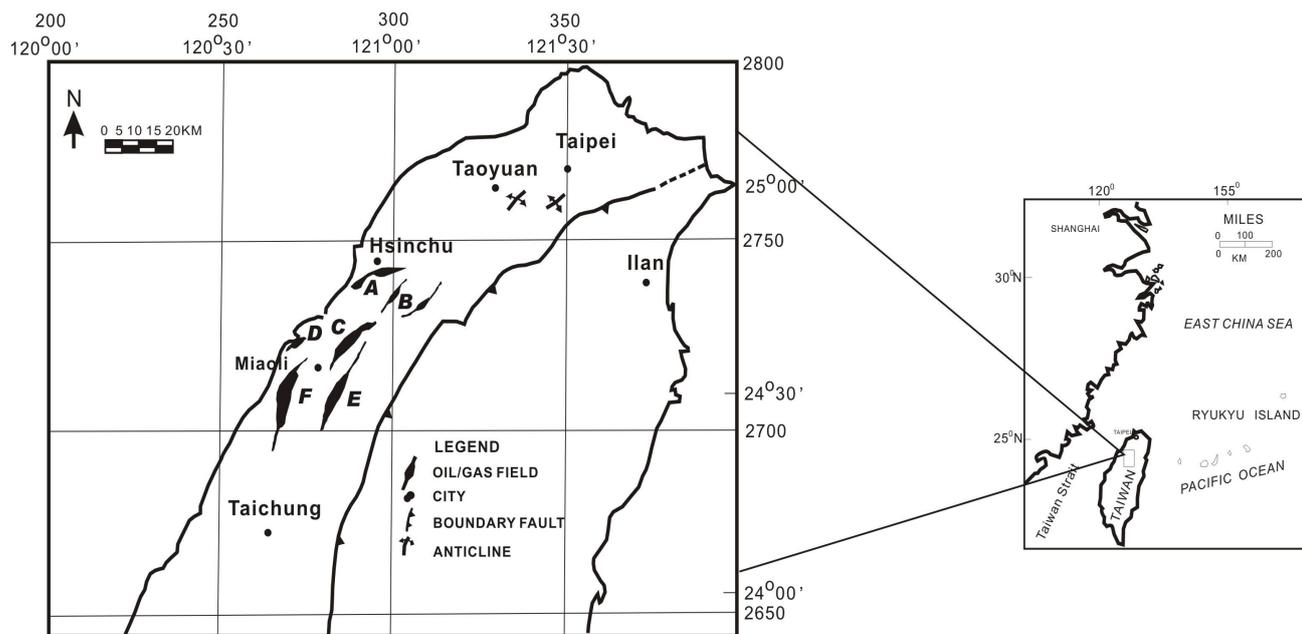


Fig. 1 Map of Northwestern Taiwan, showing the location of A, B, C, D, E, F, oil samples.