

## Overview of the Petroleum Geochemistry of Trinidad and Tobago

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### Abstract

The paper gives a historical overview of the advances in our knowledge of the petroleum geochemistry of Trinidad and Tobago starting with the discovery of the source rock in 1980, the tracing of its distribution, quality and maturity and continuing with the recognition that evaporative fractionation, an oil alteration process caused by near vertical migration, has affected most of our oil and gas/condensate fields. It lists briefly the petroleum systems that have been recognised to date. It looks at how geochemistry has been used in the past in exploration efforts in T&T. It also recognizes the importance of geochemistry applications in later exploration efforts, especially in deeper pool exploration. Finally it looks at future potential as recognised from the general geochemical concepts like source rock type, distribution, thickness, richness and maturity and from evaporative fractionation. It recognizes *inter alia*, the importance of the use of evaporative fractionation as a predictive tool when exploring for deeper pools in known oil and gas/condensate accumulations.

Following are some of the main historical highlights that will be looked at in the oral presentation.

- The upper Cretaceous Naparima Hill Formation was first recognised as the source rock for Trinmar oils in 1980 when the first oil-source correlation was done by Persad and Dow. That study also eliminated the younger shales as potential source rocks for oils.
- Subsequent studies from 1989 onwards based on analyses by Persad et al. of over 150 produced oils and 50 extracts from source rocks have confirmed that Naparima Hill and Gautier Formations are the source of virtually all of the oils produced in Trinidad, including the Gulf of Paria, onshore south Trinidad and the East Coast Marine Area
- The 1989 study also recognized that evaporative fractionation, an oil alteration process caused by gas loss from oil by vertical migration along faults, has affected most of the oil and gas/condensate fields in Trinidad. In this process, the deeper residual oils become heavier and waxier due to depletion of lighter low molecular weight hydrocarbons and are accompanied by evaporative fractionation and increased aromaticity (i.e. increase in aromatic hydrocarbons relative to normal alkanes of similar molecular weight), while the shallower oil and gas/condensate accumulation from upward migrating gas are lighter and depleted in heavier waxier components. The recognition of the oil alteration by evaporative fractionation has led to the discovery of deeper oil pools underlying shallower lighter oil or gas/condensate accumulations
- They recognised also the presence of a minor Tertiary oil source in the Gulf of Paria Pull Apart Basin and at two other, also minor to the present time, sources for liquid hydrocarbons in the North Coast Marine Area and the Tobago Basin
- In 1995, Persad et al. expanded their studies and identified eleven petroleum systems. Magoon and Dow had earlier (1994) recognized that petroleum geochemistry in general and particularly identification of petroleum systems were fundamental to petroleum exploration

and suggested that if used following an analysis of a sedimentary basin it can be a very valuable and inexpensive tool for establishing the petroleum potential of an un-explored or under-explored area.

A comprehensive look at the remaining exploration potential of all of the basins in and around Trinidad and Tobago, onshore and offshore, was done (Persad et al., 2013) based on the geo-tectonic history and the petroleum geochemistry of the area.