

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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The Occurrence and Origin of Anomalously High CO₂ Gas Reservoirs in The Pattani Trough, The Gulf of Thailand

This paper discusses the distribution of anomalously high carbon dioxide (CO₂) in gas reservoirs of the Platong gas field in the Pattani Trough. Stable carbon isotopic data and a structural model are presented to discuss the origin of the CO₂-rich gases. The Pattani Trough is an elongated N-S trending Tertiary rift basin with high heat flows, located in the Gulf of Thailand. Hydrocarbons (gas, condensate and to a lesser degree oil) are trapped in Miocene fluvial sandstones within highly faulted graben systems.

The CO₂ contents of most gases in the Pattani Basin show an overall increase with depth from a few percent to near 25%. These gases largely originated from the thermal decomposition of land-plant organic matter during maturation. Some wells in the Platong and Erawan fields however encountered gas reservoirs containing CO₂ above 60% and as high as over 90%. At the Platong G Platform, the vertical and lateral distribution of high CO₂ forms a large plume, related with a structural nose above a local high of basement rocks. Carbon isotopic analyses suggest that these anomalously high CO₂ occurrences are of inorganic origin. Geological and geophysical data suggest that these gases were generated by the thermal decomposition and/or dissolution of the pre-Tertiary basement carbonates; they migrated upward through deep-seated bounding faults which provided the fluid conduits. The structural complexity at the Platong G nose facilitated fluid migrations vertically and laterally, resulting in the mixture of normal (5-25%) and anomalously high (60 to over 90%) CO₂ gases.