

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

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Geochemistry Of The Macuspana Basin (Mexico): Thermogenic Accumulations In Bacterially Impregnated Sediments

The Macuspana basin is located in the southeastern part of Mexico. The discovered gas reservoirs are located in Miocene and Pliocene faulted anticlines. The Macuspana Basin has been considered to be mainly a gas-prone basin.

Both the chemistry and isotopic signatures of gases evidence two hydrocarbon families. The family 1 is characterized by gas wetness superior to 7%, and C1/C2 ratios less than 21, whereas the family 2 is constituted of much drier gases (wetness smaller than 3.5%, ratios C1/C2 greater than 60). The carbon isotopes signatures of the two families are also very different, all the gas compounds of the family 1 being heavier in family 2. The family 1 presents all the characteristics of thermogenic gases, both from the chemical and from the isotopic compositions. They show very homogeneous chemical and isotopic compositions suggesting a single source and a very narrow range of maturity. Plotting the gases from family 1, it appears that all these gases are relatively low mature, representing products generated at the end of the oil window (eq.VR of 0.8-0.9 %), without any evidence of secondary cracking. The relatively heavy $\delta^{13}\text{C}$ values of propane and butane (around -23 and -22 o/oo, respectively) from family 1, associated to the fact that the generation occurred in the oil window (i.e. without secondary cracking), infers an isotopic signature of about -22 o/oo for the source. The family 2, very dry chemically and with light isotope signatures of methane (< 58 o/oo) is more characteristic of a bacterial family.