Formation and Occurrence of Natural Gases in Mexico

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ABSTRACT

Natural gases in Mexico vary widely in their composition and isotopic properties and closely reflect the different geologic settings in the respective basins:

Burgos Basin: Gas isotope data indicate thermogenic origins of a wide variety of maturities in the predominantly Tertiary reservoirs that are arranged in trends of different ages that become younger to the East of the basin. Oligocene reservoirs tend to contain more mature gases than Eocene reservoirs, whereas Paleocene reservoirs produce the most mature gases in the basin that have, in some instances, the character of super-mature gases similar to those in Barnett shale "isotope rollover" areas. Gas properties in the individual reservoir trends do not exhibit any relationship to depth, indicative of structurally controlled migration similar to the Gulf of Mexico shelf offshore Texas/Louisiana. A few gases from Lower Cretaceous reservoirs have also a super-mature character and are similar to those in the Paleocene suggesting that the Lower Cretaceous is the source of the Paleocene gases in the Burgos Basin. The Cretaceous at lower maturities is possibly also the source for the gases in the Oligocene to Miocene reservoirs.

Tampico Basin: The hydrocarbon gases in the CO_2-rich Quebrache area in the Tampico Basin are from low maturity source rocks. In the south of the basin are more mature gases. The hydrocarbon maturity of the gases is independent of the CO_2 concentration, suggesting that migration of CO_2 is independent of hydrocarbon migration.

Southeast Basins: Gas isotope indicate there are two types of petroleum-gas systems: (i) Fields with primarily thermogenic gases from source rocks with type II kerogens (Reforma, Marina) and possibly Type III kerogens (Papaloapan). (ii) Gases in the Macuspana and Cuichapa fields are pervasively mixed bacterial and thermogenic gases. The thermogenic end-member in Macuspana is a mature to post-mature thermogenic gas indicating deep, high-temperature gas kitchens. The gas properties in the Macuspana Field are completely independent of reservoir age, suggesting structurally controlled migration from deep gas kitchens into reservoirs that are charged with bacterial gas.

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