

Geochemical Processes Responsible for the Sour Gas Accumulation in the Bohai Bay Basin: A Case Study from the Northern Jinxian Sag

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Sour gases from the northern Jinxian Sag of Bohai Bay Basin (China) are highly unusual as they contain up to 92% hydrogen sulfide and are associated with extremely sulfur rich oil. Because the current temperatures of most sour gas reservoirs in this area are below 100°C, many researchers believe that these gases were originated from bacterial sulfate reduction of mildly biodegraded S-rich oil at a location outside the current reservoirs. However, it is uncertain how the transport of hydrogen sulfide from the reaction site to the current reservoir could change the hydrogen sulfide concentration of a gas from <3% to 92%, whether this compositional fractionation has had any impact on their sulfur isotope values, and where the unaccountable methane could have gone. An alternative source could be the thermochemical sulfate reduction occurring in deeper parts of the Eocene reservoirs. This manuscript contributes to this fascinating debate on the prevailing geochemical processes by reviewing on the reservoir temperature distribution, regional geothermal history, and available molecular and isotopic data of various reservoir fluids and sulfur species.