

Globally extremely abnormal mercury abundance suggesting mantle degassing volatiles in natural gas

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While the occurrence of Hg compounds as mantle sourced solid ore in the Earth's crust have been widely documented in various studies, abundant Hg in the commercial gas reservoirs is still confused. We present recent findings which indicate that, under some circumstances, abnormal high Hg concentration as a representative of mantle degassing volatile may migrate and entrap in the commercial abiogenic alkane gas reservoirs. The Hg concentration in 17 gas samples from the Qingshen gas field in the Songliao Basin, NE China is in the range of 5×10^3 - 4050×10^3 ng/m³, with the average value of 1148×10^3 ng/m³. The maximum value in this study is higher than that of 3000×10^3 ng/m³ in the gases from Wusite Ralph gas field in Germany which were reported as the highest concentration around the world. Hg concentration in three Chinese sedimentary basins of Tarim, Sichuan and Ordos is distributed in the range of 0.01×10^3 - 296.8×10^3 ng/m³. Natural gases in the Sichuan and Ordos basins were sourced from thermal decomposition of organic matters, without any evidence suggesting the mantle contribution to the gas pools. Most natural gases in the Tarim Basin were also derived from the sapropelic or humic organic matters, and only a little contribution of mantle sourced gas was made in the southwestern depression of the Basin, with the maximum Hg concentration of 296.8×10^3 ng/m³. Thus, the Hg concentration in the natural gas sourced from organic matters is much less than that in the mantle-derived gas. Therefore, we demonstrate that the absolutely higher Hg concentration in natural gas might be a direct evidence for the contribution of mantle degassing volatile to the gas pool. The varied Hg concentration observed is due to different contribution proportions of mantle degassing volatile to the gas pool. The geological and seismic profiles indicate that three areas with abnormal high Hg concentration are located nearby the volcanic vents. Considering the negative effect of Hg to the production equipments, ecological environment, and human health, we strongly appeal the Hg removing for mantle degassing gas alone or mixing gas with thermogenic gas.