The Discovery of Helium Gas in South Ganga Basin, Sagar Division, M.P. India – Arun K. Shandilya, Deptt. of Applied Geology, Dr. HSG University, Sagar M.P. Email: *akshandilya_u@rediffmail.com*

A rare discovery of the Helium and Petroleum Gas in more than 54 tube wells in and around Sagar town in Sagar Division (1993 to 2015 period) in the rocks of upper Rewa sandstone of the Vindhyan Supergroup. The discovery of the rare gas Helium in hydrocarbon rich zone in the tube wells in agricultural field in the villages in Sagar division of M.P. is a unique finding in rocks of the Vindhyan Supergroup. The depth of tube wells are varying in 300 feet to 1000 feet.

On the basis of geochemical and stable isotopic analyses of the soil, water and gas samples held at Geochemical Lab of KDMIPE, ONGC, Dehradun and National Geophysical Research Institute (NGRI) Hyderabad, it is remarkable to note that average values of rare gas helium contents varies from 0.34% to 0.732% along with the 72% to 99% of methane and ethane, and minor amount of oxygen, nitrogen and CO_2 gases in the hydrocarbon rich zone are recorded. The west central part of the Vindhyan basin around Sagar area is characterised by the presence of the helium along with hydrocarbon gas in upper sandstone rocks of Rewa Group, which was overlain by the Deccan trap basaltic lava flow, iot6 is acting as trap or cover rocks over these gaseous sandstone. The occurrence of the various inlier of the Vindhyan rocks are containing the helium and hydrocarbon gases. Invariably we do not get the gas during the monsoon period, after the monoson period, after Nov. every year there is leakages of both the gases coming from the tube wells. The part of the Vindhyan basin which is not covered with the Deccan trap basalt, do not have any chances of storing these gases/rare gases.

The intrusion of the dome structure of Jabera area in Damoh district, about 140 km east of the study area, must be responsible for the generation of these gases by fractionation under high temperature and pressure condition. These gases were formed in the later phase of folding in the lower, middle and upper Vindhyan rocks. In the gently folded rocks around Sagar area these gases are contained.

The stable isotopic analysis suggests the stable isotope δC^{13} value for the methane is - 43.6 per mil to - 54.9 per mil w.r.t. PDB and for the ethane gas is -24.9 to -26.4 per mil w.r.t. PDB in the gas samples collected in the saturated sodium chloride solution in the glass bottles at various sites in Sagar and Damoh districts. The occurrence of rare helium gas in the hydrocarbon rich zone is reported first time in January 2007 from the tube wells of Sagar district, which were geochemically and stable isotopically analyzed in the labs of KDMIPE, Dehradun and NGRI, Hyderabad. The gaseous hydrocarbon analysis show the presence of moderate to low concentration of methane (C1) 1 to 104 ppb, Ethane (C2) -1 to 14 ppb, Propane (C3) 1 to 10 ppb, i- Butane (i C4) 1 to 9 ppb and n- Butane (n C4) 1 to 8 ppb in the soil samples collected from different locations.

The isotopic composition of the hydrocarbon gases are governed by their source characteristics. In case of the thermogenic gases the maturity of the parent kerogen at the time of gas generation also affect the isotopic composition of the gas. The migration does not appear to affect the isotopic signature of the hydrocarbon gases, although due to diffusion through imperfect seals in a reservoir, isotopically lighter ^{12}C methane may preferentially escape leaving behind isotopically rich gas in a reservoir. Biogenic and thermogenic gas can be distinguished based on molecular and isotopic composition. The biogenic gases are depleted in higher hydrocarbon gas, like ethane, propane, butane etc. The methane is biogenic gas if the isotopic value of the δC^{13} -55%.

The helium gas in the upper sandstone of Rewa Group of rocks of the Vindhyan Supergroup are generated from thermal cracking of U^{238} (U^{238}- Pb_2O_6 + He) and kerogen. No mixing with any biogenic gas has taken place after the generation of thermogenic gases.

The result of the soil gas and stable isotopic analysis of Ethane gas in these samples δC^{13}value are ranging from -24.9 per mill w.r.t. PDB and -26.9 per mill w.r.t. PDB are indicative that this gas is of thermogenic origin, which must have been formed at very high temperature and pressure condition in the deeper horizon of the Great Vindhyan sedimentary basin of late Proterozoic (> 600 m.y.) period.