

## GEOSCIENCES AND REMOTE SENSING

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GEOCHEMISTRY, ENVIRONMENTAL CHEMISTRY AND  
ATMOSPHERIC CHEMISTRY

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**The discovery of helium gas in South Ganga Basin, Sagar division, Madhya Pradesh, India****Arun K Shandilya**  
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A rare discovery of the helium and petroleum gas in more than 58 tube wells in and around Sagar town in Sagar division (1993 to 20015 period) in the rocks of Upper Rewa sandstone of the Vindhyan Super Group. The discovery of the rare gas helium in a hydrocarbon-rich zone in the tube wells in an agricultural field in the villages in Sagar division of MP is a unique finding in rocks of the Vindhyan Super Group, in the history of Earth Science in India. The depth of tube wells is varying from 300feet to 1000feet. On the basis of Geochemical & Stable Isotopic analyses of the soil, water and gas samples held at Geochemical Lab of KDM IPE, 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<sub>2</sub> gases in the hydrocarbon-rich zone are recorded. In the west-central part of the Vindhyan Basin around Sagar area is characterized 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, it is acting as the trap or cover rocks over these gaseous sandstone. The occurrence of the various inliers of the Vindhyan rocks is containing the helium and hydrocarbon gases. Invariably we do not get the gas during the monsoon period, after the monsoon period, after Nov every year there are 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. During the intrusion of the dome structure of Jabera area in Damoh district, about 140km east of the study area must be responsible for the generation of these gases by the fractionation under high temp. & pressure condition. The gently folded rocks around Sagar area also contain these gases. The stable Isotopic analysis suggests the stable isotope  $\delta^{13}\text{C}$  value the values for the methane is -43.6 per mil wrt to -54.9 per mil wrt PDB and for the ethane gas is -24.9 to -26.4 per mil wrt PDB in the gas samples collected in the saturated sodium chloride solution in the glass bottles at various sites in Sagar & Damoh district. The occurrence of rare helium gas in the hydrocarbon-rich zone is reported first time in Jan 2007 from the tube wells of Sagar district, which were geochemically and stable isotopically analyzed in the labs of KDMIPE Dehradun & NGRI Hyderabad. The gaseous hydrocarbon analysis shows the presence of moderate to low concentration of methane (C<sub>1</sub>) 1 to 104 ppb, Ethane (C<sub>2</sub>) 1 to 14 ppb, Propane (C<sub>3</sub>) 1 to 10 ppb, i- Butane (i C<sub>4</sub>) 1 to 9 ppb and n-Butane (n C<sub>4</sub>) 1 to 8 ppb in the soil samples collected from different locations. 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 the biogenic gas if the isotopic value of the  $\delta^{13}\text{C}$  -55%. The helium gas in the upper Sandstone of Rewa group of rocks of the Vindhyan Super Group is generated from thermal cracking of U-238 (U-238- Pb-206 + He) and Kerogen. No mixing with any biogenic gas taken place after the generation of thermogenic gases. The Result of the soil gas and stable isotopic analysis of ethane gas in these samples  $\delta^{13}\text{C}$  value are ranging from -24.9 per mill wrt PDB and -26.9 per mill wrt PDB is indicative that this gas is of thermogenic origin, which must have been formed at very high temperature & pressure condition in the deeper horizon of the Great Vindhyan sedimentary basin of late Proterozoic (>600 my) period.

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