Geochemical features of the Aladag Fe-Cu-Zn-Pb skarn deposit (Ezine/Canakkale-North West Turkey)

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Aladag skarn zone located 8 km southwest of Ezine County (Çanakkale-Turkey). The basement of the study area is formed by recrystallized limestones of the Middle-Late Permian Bozalan Formation. Cretaceous Denizgoren Ophiolites thrusted over the Bozalan Formation. Upper Oligocene-Lower Miocene Hallaclar Volcanics consist of andesite, basalt, rhyolite and pyroclastic rocks cover the other units. Also Upper Oligocene-Lower Miocene Kestanbol Pluton cuts the older units and represented by mainly quartz-monzonite, monzonite, monzodiorite porphyry, syenite porphyry and quartz-syenite porphyry. Lower-Middle Miocene Ezine Volcanics composed of pyroxene-andesite and trachyte [1,2].

Skarn type mineralization was developed between the Bozalan Formation and Kestanbol pluton depending on the intrusion of the pluton at the north of Aladag. Endoskarn and exoskarn zones developed in the skarn zone. Some Ca-Mg silicate together with Fe, Cu, Pb, Zn oxide and sulphide minerals were developed in the skarn zone [1, 2]. (Fig. 1).

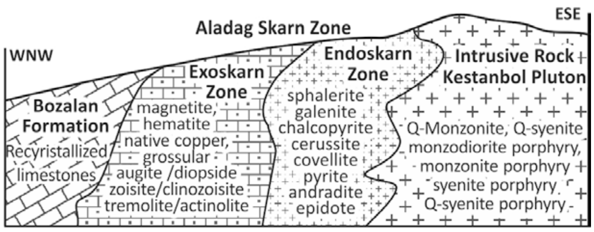

Figure 1. Schematic cross-section of Aladag skarn zone

Endoskarn zone is rich in Pb-Zn-Cu and the amounts of SiO_2, Al_2O_3, Fe_2O_3, Cu, Pb, Zn and Ag are 41.77%, 4.28%, 15.93%, 3.53%, 4.5%, 4.83% and 34 ppm respectively.

Exoskarn zone is rich in Fe and Fe_2O_3, SiO_2, Al_2O_3, MgO, CaO, Cu, Pb, Zn and Ag amounts are 66.75%, 14.85%, 1.37%, 4.34% and 8.63%, 112 ppm, 162 ppm, 213 ppm and 0.4 ppm respectively. There are significant increase in the amounts of Ca and Mg from intrusion rocks to wall-rocks in the skarn zone.

[1] Arik and Aydin, (2010), *Selcuk Univ. Sci. Res. Fund. Projects,* **97p**, [2] Arik and Aydin (2011), *Sci. Res. Essays*, **6(3)**, 592-606.

In situ secondary hydrocarbon cracking in a carbonate reservoir

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The Jean Marie member of the Redknife Formation in NE British Columbia, Canada is an Upper Devonian gas-rich (approx. 10 TCF) limestone zone, 15 to 100 m thick, lying unconformably on top of the Fort Simpson Formation and covered by the Redknife Fm. shale. The Jean Marie member is a low-permeability reservoir with dissolution related porosity and permeability locally enhanced by secondary dolomitization and fracturing. The reservoir is severely underpressured and of low water saturation. Carbon stable isotope analysis of natural gases has been used to assist hydrocarbon production from the reservoir. Here we present results from a $\delta^{13}C$ study of Jean Marie gases.

Natural gases in the Jean Marie exhibit significant compositional and $\delta^{13}C$ heterogeneity. Dry gases of reversed $\delta^{13}C_{C1}$ and $\delta^{13}C_{C2}$ compositions, lower $\delta^{13}C_{C2}$, and high C_2/C_3+ ratios are located in lower pressured NW domains of the study area, whereas C_2+ -richer gases of "normal" $\delta^{13}C$ compositions are produced to the SE. That trend is accompanied by increasing production pressures and gas condensate production. Geochemical data reveal limited gas mixing and significant reservoir compartmentalization. The $\delta^{13}C$ compositions and the low H_2S and CO_2 contents of the isotopically "reversed" gases indicate that these are not related to secondary processes such as sulphate reduction or microbial oxidation. Instead, the compositions of these gases are consistent with secondary cracking of hydrocarbons (SCH). The presence of pyrobitumen in the Jean Marie reservoir and the lack of liquid hydrocarbons in domains occupied with "reversed" gases both suggest that SHC occurred *in situ*. That challenges current models, which infer that the Jean Marie reservoir was charged first with oil and then with dry gas, both generated in the deeper, organic-rich Muskwa Formation. Instead, we propose that most natural gas in Jean Marie today was generated by secondary cracking of Muskwa oil and/or wet gas, and that late migration of dry Muskwa gas to Jean Marie was insignificant. SCH was more intense in the deeper western parts of Jean Marie where it produced dryer isotopically "reversed" gases. This study has important implications for the timing of migration and generation/destruction of hydrocarbons in the Jean Marie and similar carbonate reservoirs worldwide.