Coalbed Gas Potential In the Miocene Soma Basin (Western Turkey)

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The Neogene Basins of Turkey contain as much as 9 billion tons of lignite-rank coal (Sengiller, 2001; Tuncah et al., 2002). The Miocene Soma Basin, a rift basin trending NE-SW (approximately 20 kilometers by 5 kilometers) in the Aegean Extensional Province (EAP) of Western Turkey, is estimated to contain at the least one billion tons of lignite and about half of this reserve is present at depths greater than 600 m (Turkish Coal Enterprises, 2006). Miocene marillimestone units and Pliocene clastics and volcanic tuffs overlie the Miocene coals of the Soma basin. There are several coal seams in the basin but the most economical and thus target sean! is known as KM2 with an average thickness of about 20 meter across the basin. In the Soma Basin, Turkish Coal Enterprises (TKt) has mined this KM2 seam by open cut coal mining and underground mining for several decades in the Northern and Central part of the basin, respectively. Recently, coal exploration activities have been extended to the Southern part of the basin by means of exploratory drillings. Recently, coal exploration activities have been extended to the Southern part of the basin by means of exploratory drillings. In this context, two boreholes encountering a coal seam (KM2) up to 20 m thick were evaluated. The KM2 coal seam was encountered between 900 and 940 m depth in two boreholes drilled approximately I km apart. Wellhead gas content was measured on coal cores following the USBM method (Diamond and Levine, 1981). Additionally, coal was placed in hermetically sealed canister and desorbed gas was analyzed in laboratory for chemical composition (by FTIR gas analyzer) and 13C isotope (by Ge-IRMS). Coal characterization was completed by means of Rock Eval (RE) Pyrolysis, Proximate and Ultimate analyses, as well as microscopic analyses for typing of macerals and vitrinite (hurninte) reflectance measurements.

The wellhead gas content measurements (six. core measurements from two boreholes) indicate that as much as 4 m^3 gas / ton coal is present in the coal recovered from 900 to 940 m below the surface. The rank of coal based on vitrinite (hurninte) reflectance measurements is lignite to sub-bituminous (0.40 to 0.45 % Ro); supported by RE Tmax values of 420 DC. TOC content of the coal samples vary between 53 to 73 %. The composition of the gas is dominantly methane (more than 99.4 %) and the l3cl^{2}c isotope ratio of methane is 61 to 65 per mil. Considering the chemical composition of the gas and the del 13C isotope of the methane, the source of the coal gas is biogenic probably generated by bacteria. The maceral analyses show that coal samples on average contain more than 60 % huminite(vitrinite). Adsorption on the internal coal surface is considered as the primary mechanism of gas storage in coals and the surface area, which controls the gas adsorption capacity, is in general a function of the micropore volume (Levy et al., 1997; Crosdale et al., 1998) which is known to be abundant in vitrinite maceral group. The vitrinite/hurninite masera1 content has positive correlation with gas sorption capacity (Levy et al., 1997); meaning that at a given pressure, the higher percentage of micro-pore dominated huminiteivitrinite the more gas adsorption capacity. In this context, the Miocene Soma lignites have good micropore properties in respect to gas adsorption.

Preliminary evaluation, based on limited analyses and results summarized above, on gas potential of the Miocene Soma Basin is encouraging, yet further investigations in the Soma Basin are underway by coal desorption testing of cores received from ongoing coal exploration boreholes.

Twenty Seventh International, Pittsburgh Coal Conference
Coal Energy, Environment and Sustainable Development
October 11-14, 2010, Istanbul Hilton
Session 22, Coal Science: CBM/Carbon Dioxide, Oral Presentation 22-3,
Abstract Booklet, pp.21