Original mineralogy and determining depositional condition of the Akchagyl Formation based on elemental geochemistry analysis in southeastern Caspian Basin

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Abstract

The Pliocene deposits in northern Iran including Cheleken and Akchagyl stratigraphic units are considered as the most important elements of petroleum system in the Caspian Basin. The Cheleken stratigraphic unit is mainly composed of the coarse-grained red-coloured continental facies with the age of Early to Middle Pliocene, and the Akchagyl unit mainly consists of white-coloured carbonate-clastic facies with the Late Pliocene age. In the present research, three outcrops (Aghband, Somli Darreh and Yelli Badragh) in the northeastern part of the Gonbad-e Kavous area were measured as the thickest and oldest Tertiary sequences. The main purpose of the study is to determine original mineralogy and depositional conditions of the Akchagyl Formation using elemental geochemistry analysis in the measured surface sections.Variations of the major and minor elements in the Akchagyl carbonate samples indicate the aragonite and high-Mg calcite mineralogical composition. Sr/Ca versus Mn variations represents the presence of semi-closed diagenetic system during formation of the Akchagyl unit in the basin. The high Mn-values in mud-dominated samples indicates the sub-anoxic condition whereas the low values of Mn and high Sr contents in grain-dominated samples represent the effect of meteoric diagenesis (dissolution) in the depositional basin. Comparison of the major/minor elements values with the standard mean values in other sedimentary basins indicates a semi-closed basin during deposition of the Akchagyl in the Late Pliocene, and the upward salinity decreasing of the basin is due to the fresh water input and its connection to the global oceans in some time intervals of the Pliocene.

Keywords*: Southeastern Caspian Basin, Akchagyl Formation, Sedimentary geochemistry, Diagenesis, Depositional environment*