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Original Aragonite Mineralogy as the Best Hydrocarbon Reservoir in Both Zagros and Kopet-Dag Basin in Iran

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ABSTRACT

The Asmari (Oligo-Miocene) and Mozduran (Upper Jurassic) formations are the most important Oil and Gas reservoirs in Iran. These formations consist mainly of limestone and dolomite with minor intercalation of sandstone and evaporite beds. Petrographic, elemental (Mg, Ca, Na, Mn, Sr and Fe) and oxygen and carbon isotope analysis indicate that original carbonate mineralogy was aragonite in both Asmari and Mozduran formations. Due to dissolution of unstable aragonite mineralogy, many digenetic features such as different type of porosity (fracture, channel, vuggy, moldic, intercrystalline and large cavity) and karstific features have increased the hydrocarbon fluid migration through the Asmari and Mozduran formations. In addition, other petrographic features such as acicular to fibrous isopachous cements, shattered micritic envelope, spalled ooids, Sr inclusion in micrites, and diffuse laminae all indicate original aragonite mineralogy. Chlorozoan assemblages, early (dolomicrite) and late diagenetic coarsely crystalline dolomite, collapse solution breccias and calcitized pseudomorph after gypsum all support original aragonite mineralogy. High Sr and Na contents indicate that original carbonate mineralogy was aragonite, as Sr (8000 to 10000 ppm) and Na (2700 ppm) are high in recent warm water subtropical marine aragonite compare to calcite mineralogy. The ratio of Sr/Na is >1 in modern warm water aragonite shelf carbonate, while in recent low-Mg calcite in non-tropical carbonates is <1. The high Mn and Fe values and the ratio of Sr/Mn versus Mn and Sr/Ca and oxygen isotope versus Mn show alteration in open diagenetic systems. The inverted J trend indicate that these carbonate sequences have been effected mainly by meteoric diagenetic system, followed by burial diagenesis. This research suggests that determination of original carbonate mineralogy can be used as main targets for hydrocarbon exploration.