

## **STABLE ISOTOPIC GEOCHEMISTRY, DIAGENESIS AND SEQUENCE STRATIGRAPHY OF THE UPPER CRETACEOUS SUCCESSIONS, NORTHWESTERN IRAQ**

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### **ABSTRACT**

*Stable isotopic geochemistry of the Upper Cretaceous (Cenomanian-Early Campanian) successions is carried out from northwestern Iraq. These successions are represented by three formations; Gir Bir, Wajna, and Mushorah. The upper parts of the Gir Bir Formation was under the mixing zone effect depending on the gradual increment in oxygen and carbon isotopes with depth. Whereas sharp negative values of  $\delta^{18}O$  and  $\delta^{13}C$  in the upper surface of the Gir Bir Formation and in the bed of conglomerate and breccia are indicative of exposure surface conditions and effect of meteoric water. While in the succession of Mushorah Formation, there is a homogeneity in the values of oxygen and carbon isotopes and other elements indicating its ineffective diagenesis near the surface. Gradual variation in  $\delta^{13}C$  from positive in the upper part of Gir Bir Formation to low and negative values at the surface of the Formation and in the bed of conglomerate and breccia reflects a regressive sequence from deeper to shallower areas upwards of lagoonal facies and then to exposure (marine regression and platform exposure) forming unconformity surface. Sharp increase in the  $\delta^{13}C$  in Mushorah Formation reflects deep marine (transgressive) conditions covering most of exposed parts of the platform. Three 3rd order sequences constitute the studied Cenomanian-early Campanian carbonate succession of northwestern Iraq and were deposited in a period between 99.6 Ma – 80.6 Ma. The succession was affected by near-surface and deep burial diagenesis represented by cementation as indicated from various types of cement (granular, blocky, syntaxial rim, drusy mosaic and fibrous), neomorphism as indicated from recrystallization of micritic groundmass to microspar and inversion of aragonitic shells into calcite, dolomitization in various dolomite textures, dedolomitization as observed from composite calcite rhombs and rhombic pores, silicification in the form of chert nodules, authigenesis of glauconite and pyrite, compaction as indicated from pressure solution and stylolitic textures, micritization, solution in the form of fissures and karst phenomenon and porosity formation. The common porosity types are intergranular, fenestral, intercrystalline, moldic, vuggy, channel and fracture. Three porosity zones (I, II, and III) are also identified. The upper part of zone (II), which coincides with the highstand system tract (HST) of sequence (B) is highly porous and regarded on the main reservoir unit in the middle and upper parts of the Gir Bir Formation. Fracture and moldic and vuggy dissolution features in addition to karstic and fissure features are responsible for the porosity increase in this fractured reservoir unit.*

**Keywords:** Sequence stratigraphy, Stable isotopes, Diagenesis, Upper Cretaceous, Iraq