



Diatomites Across the western Cretan Realm: From Depositional Environments to Energy Potential

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ABSTRACT

Diatomites are silica-rich sedimentary deposits formed by the accumulation and preservation of abundant diatom frustules. Their formation reflects high diatom productivity, adequate preservation, and limited dilution by terrigenous or other sedimentary material [1]. Such paleodepositional successions record productivity, sediment supply, water-column conditions, and post-depositional processes. Within the Mediterranean, they are widespread in Cenozoic basins and associated with major palaeoceanographic and climatic changes. In the Cretan region, previous studies have highlighted the geological and organic-geochemical significance of diatomitic successions in western Crete pointing out their importance as source rocks for hydrocarbons generation [2], while the Gavdos record provides important stratigraphic and palaeoenvironmental constraints on Messinian (pre-evaporite) diatomite deposition [3].

This study presents a comparative geological and geochemical investigation of diatomite-bearing successions between a) onshore western Crete (Kalyves), and b) Gavdos Island, southern Greece. The two areas represent distinct depositional settings within the eastern Mediterranean and allow evaluation of regional variability in biosiliceous paleosedimentation. Selected intervals are investigated through detailed field observations, polarized light microscopy, and laboratory methods such as Rock-Eval pyrolysis VI (RE VI), elemental and oxide geochemistry by X-ray fluorescence (XRF), mineralogical analysis by X-ray diffraction (XRD), scanning electron microscopy with energy-dispersive spectroscopy (SEM-EDS), and complementary organic-geochemical analyses. Elemental ratios and normalized XRF data assess carbonate and terrigenous input, biogenic silica enrichment intervals, redox conditions, weathering, and marine influence. Rock-Eval characterizes organic-matter quality and quantity, kerogen type, thermal maturity, and hydrocarbons generation potential, whereas SEM-EDS reveals mainly micro textures, diagenetic status and biogenic composition. The overall aim is to identify the paleoenvironmental controls on the organic-matter preservation of diatomite formations, and their potentiality to work as hydrocarbons source rocks. Considering the present energy issues in Europe, this comparison also extends to the broader energy potential of sedimentary systems in Greece and the wider Eastern Mediterranean, as depositional conditions directly control organic-matter preservation and subsequently source-rock quality.

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