# V CONGRESO DEL CRETÁCICO DE ESPAÑA

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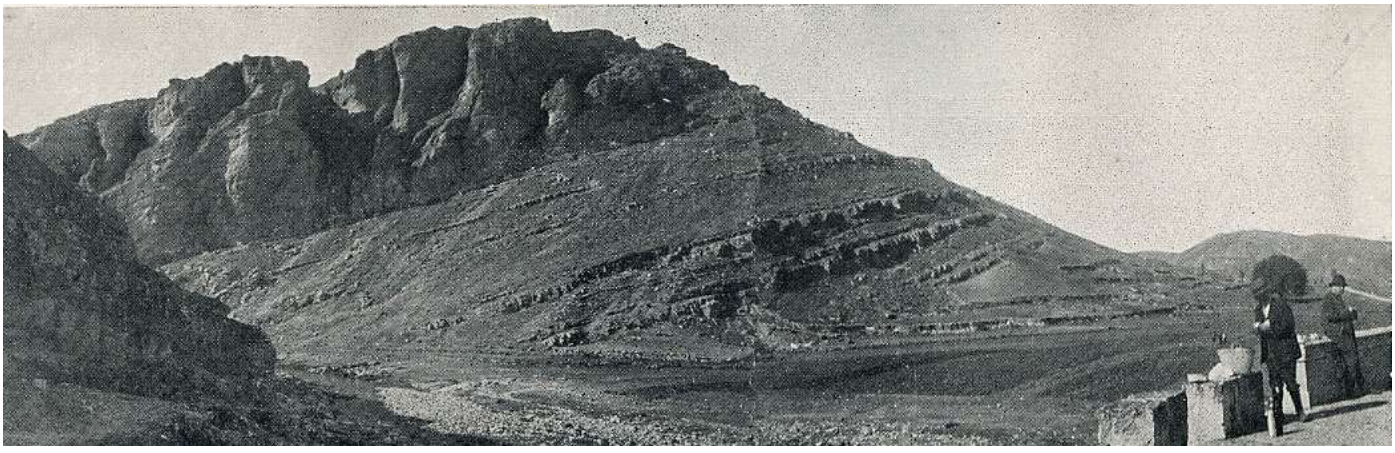

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# IRONSTONE OCCURRENCES IN THE UPPER MEMBER OF THE CENOMANIAN BAHARIYA FORMATION, BAHARIYA DEPRESSION, WESTERN DESERT, EGYPT

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Most of the stratigraphic succession exposed at the Bahariya Depression, central Western Desert, is ferruginized. That's the case of the Lower Cenomanian Bahariya Formation, the Upper Cenomanian El Heiz Formation, the Campanian Hefuf Formation, the lower Middle Eocene Naqb Formation, the Upper Eocene Hamra Formation, the Oligocene Radwan Formation and the economic ironstone deposits of the three minable areas in the northern part of the Depression where the ironstone deposits replace the Middle Eocene Naqb and Qazun formations. Except for the later economic deposits, the ironstone occur mainly as iron crusts, concretions and irregular ferruginous bands in sandstone, siltstone, glauconitic shale and limestone beds.

The stratigraphic and sedimentological analyses of the siliciclastic sandstone- variegated shale forming the upper member of the Bahariya Formation at Gabal Ghorabi and Naqb El Harra area, northern Bahariya Depression, allow to distinguishing five facies, i.e. thinly laminated siltstone, cross bedded sandstone, glauconitic and fossiliferous sandstone, variegated glauconitic shale and ironstone. The sandstones are mainly quartzarenite, subarkose and hybrid glauconitic arenite with variable amount of fossils mainly mollusks and plant remains. These facies were deposited in shallow marine setting with predominance of intertidal- subtidal flats overlying fluvial and deltaic plain deposits. In the studied sections, the siliciclastic beds are commonly separated by ironstone bracketing the permeable facies. The ironstones are more abundant towards the top of the sedimentary sequences and are observed to outline discontinuities of different orders (bedding planes, bioturbations, dewatering structures, etc). Accordingly, ironstone forms concretions, botryoidal, massive and irregular bands of centimeter scale showing wide lateral continuity through the northern part of the depression. XRD analysis, SEM observations and standard petrography show that up to 70% of massive goethite and hematite occur in the arenites, where goethite is more abundant than hematite. Other minerals present are iron-rich carbonates (ankerite, dolomite and siderite), calcite, glauconite, chamosite and manganese minerals. Goethite and hematite often occur as cement phases between the silicate grains, while some of the quartz grains are slightly corroded by iron phases. Iron textures are characterized by globular, cluster, mammillary and amorphous aggregates of goethite and acicular and tabular aggregates of hematite. Both cementing and replacing iron-rich carbonates as well as bioclasts are intensively replaced by goethite and hematite. Cements of carbonate are found in vugs and fracture porosity.

We interpret that, the iron oxides and iron oxihydroxides in ironstones formed under oxic conditions during late diagenetic stages affecting the Cenomanian Bahariya Formation likely in the Turonian- Santonian erosion and non-deposition episode. Both goethite and hematite cemented the arenites and/or formed after iron-rich carbonates derived from iron-rich burial diagenetic fluids that moved through permeable layers and discontinuities.

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