MINERALOGICAL CHARACTERIZATION OF ANOXIC MARINE OIL SHALES DEPOSITS: A CASE STUDY FROM CENTRAL EASTERN DESERT OF EGYPT

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Upper Cretaceous oil shales are accumulated on the stable shelf within intracratonic sedimentary basins at the central and southern part of Egypt. We present integrated mineralogical analyses for three oil shale horizons from the Duwi and Dakhla formations in the Central Eastern Desert of Egypt. The nannofossil biostratigraphy study confirm that oil shales were deposited during Maastrichtian between ~ 70.63 to 67.7 Ma. Carbonates, phyllosilicates, quartz, fluorapatite and sulphides are the main inorganic constituents in the studied Maastrichtian oil shales. The Duwi oil shales contain calcite (up to 87 wt.%) as a main carbonate mineral. The phyllosilicates and quartz content ranges from 4 to 64 wt. % and from 3 to 37 wt.%, respectively. Fluorapatite also fluctuates between 0 to 14 wt. %. Pyrite (up to 9 wt.%) is the common sulphide mineral, whereas sphalerite is recorded in some samples (up to 6 wt. %). Meanwhile, the mineralogical composition of the Dakhla oil shales, is represented by calcite (47-67 wt.%), phyllosilicates (22-32 wt.%), quartz (3-5 wt. %), fluorapatite (up to 3 wt.%), pyrite (4-6 wt.%) and sphalerite (up to 4 wt.%). Smectite is the most significant clay mineral within Duwi oil shales, varying from 80 to 97 wt. % with minor amounts of kaolinite (~ 3-20 wt.%). Whilst, Dakhla oil shales are characterized by dramatically decrease of smectite content (~59-7 wt.%), which are coincide with enhanced kaolinite contents (up to 93 wt. %). Based on detailed optical studies, chemical composition analysis of clay minerals and bulk geochemistry of shale, the majority of studied clay minerals were inherited from the parental basement material and eroded to marine environment (detrital origin), with minimal authigenic inputs. The relatively variation in mineralogy in both formations reflects changes in intensity of weathering and erosion sediment source under arid and humid climates, composition of source rock, the variable influx of terrigenous sediments into the Tethyan Ocean during high and low sea levels and oxygen availability.