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The Cretaceous glauconitic sandstones of Abu Tartur, Egypt

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The Abu Tartur mine is located in the Western Desert of Egypt, 50 km west of El Kharga City. Geologically, the Abu Tartur plateau is built by a sequence of Upper Cretaceous (Campanian – Maastrichtian) phosphorites, black shales and glauconitic sandstones. The phosphate deposits are of great economic importance and have been mined since their discovery in 1967.
Outcrop sections were measured, sampled, sedimentologically characterized and described. One specific glaucony layer was investigated mineralogically and chemically in detail and compared to a subsurface sample from the mine.
Two depositional regimes can be interpreted based on sedimentary architecture and structures: 1) a deeper-water hemipelagic environment, where phosphorites and organic carbon-rich shales were deposited and 2) a shallower, prograding higher energy shelf environment with glauconies. From a sequence stratigraphic perspective 1) was deposited during the transgressive systems tract and the early highstand while 2) was deposited during the remaining highstand and a lowstand prograding wedge (Glenn & Arthur, 1990).
Petrographic and SEM investigations show that the glaucony grains are of authochtonous origin. XRF, EMPA and thin-section analyses show that the glaucony grains from the outcrop differ significantly in their chemical composition, morphology and color from the grains of the mine sample. The fresh glauconies are enriched in Fe2O3 and K2O compared to the surface samples.
XRD analyses of the clay fraction of the six outcrop samples and the mine sample show that the grains consist of illite(glauconite)/smectite mixed-layers, with more illite layers (80 %) in the mine sample.
The charge distribution diagram muscovite-pyrophyllite-celadonite shows a clear trend from smectitic glaucony to illitic glaucony, the mine sample plots exactly in the field for glauconites.
All these features indicate that the surface samples are strongly altered by weathering and that glauconite progressively transforms into iron-rich illte/smectite mixed layers and then into smectites. For any chemical and mineralogical characterization of glauconites at surface, these weathering effects have to be taken into consideration.

GLENN, C. R. & ARTHUR, M. A. (1990): Anatomy and origin of a Cretaceous phosphorites-greensand giant, Egypt. Sedimentology, 37, 123-154.