
Palygorskite in the Eocene Rocks of the Dammam Dome, Saudi Arabia

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Abstract: Clay mineralogy and petrography of the Early to Middle Eocene succession of the Dammam dome, Saudi Arabia, comprising the Rus and Dammam Formations, were studied using X-ray powder diffraction, light microscopy, and scanning electron microscopy. These formations consist of alternations of dolomite, dolomitic marl, claystone, and shale. The rocks were deposited and subjected to early diagenetic dolomitization in a shallow, coastal marginal basin characterized by rapid changes in salinity. Palygorskite occurs as interwoven fibrous mats forming fine laminae in shales and as coatings and pore-filling and pore-bridging cements in dolomitic marls. This textural evidence suggests a direct chemical precipitation, mostly post-dating dolomitization. Magnesium concentrations in presence of dolomite was sufficient for palygorskite precipitation; the necessary Si and Al were derived by dissolution of silicates under alkaline conditions. The maximum development of palygorskite was near the top of the Dammam Formation, which was deposited during a marine transgression in the Lutetian. The formation of palygorskite in marginal restricted basins in eastern Saudi Arabia took place during Paleocene-Middle Eocene time and was contemporaneous with similar occurrences in the Tertiary basins of West Africa.

Key Words: Dedolimitization • Diagenesis • Palygorskite • Petrography • Saudi Arabia • Scanning electron microscopy • X-ray powder diffraction

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