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Illitization of Smectite in Sandstones - The Permian Unayzah Reservoir, Saudi Arabia

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The transformation of smectite to illite through an illite-smectite (I-S) mixed-layer is a major clay mineral reaction that occurs in a range of diagenetic environments and is commonly observed in siliciclastic sedimentary basins worldwide. This reaction is controlled by several chemical and physical factors, the two most important of which are temperature and potassium availability within the sediments. Diagenetic illite is a major factor affecting reservoir quality in all pre-Khuff clastic reservoirs in Saudi Arabia. Illite coating in the Permian Unayzah reservoir has two main morphologies: the platelet-like and fibrous illite. The former morphology is interpreted to form by transformation of infiltrated smectite during burial. This work shows that understanding the type and distribution of early diagenesis in clastic sequences is of paramount importance for the prediction of deep burial alterations and their related reservoir properties.