
Effect of Permo-Carboniferous Climate on Illite-Smectite, Haushi Group, Sultanate of Oman

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Abstract: The Late Westphalian to Artinskian Haushi Group in the Sultanate of Oman consists of the glaciogenic Al Khlata Formation and the Gharif Formation which contains marginal marine, coastal plain, and fluvial sediments. The sequence was deposited during a global-warming event following the Permo-Carboniferous glaciation of Gondwana. Because of a varied subsidence history, these sediments range from the surface in the SE to almost 5000 m in the NW of the basin.

Mixed-layer illite-smectite (I-S) is an important constituent of the <2 µm size fraction of sandstone and shale samples in both formations at all depths. Different starting compositions lead to three distinct trends of illite layers in I-S versus temperature for different sedimentary environments and paleoclimatic conditions. The starting compositions of I-S at the surface range from an ordered I-S in the Al Khlata Formation to smectite-rich in the Upper+Middle Gharif members.

Physical, chemical and environmental factors were investigated as causes for the different starting compositions of I-S. Both formations share an identical burial history, paragenesis, thermal evolution, and source of detrital material. They differ only in environmental conditions during sedimentation. Thus, the variation in starting composition of I-S appears to be best explained by distinct weathering conditions during sedimentation of the three units. In particular, the expected low intensity of chemical weathering during glaciogenic conditions is marked by the presence of higher amounts of unstable volcanic and sedimentary rock fragments in the Al Khlata Formation.

Key Words: Haushi Group • Illite • I-S • Paleoclimate • Sultanate of Oman • Upper Paleozoic

Clays and Clay Minerals; April 1999 v. 47; no. 2; p. 131-143; DOI: [10.1346/CCMN.1999.0470203](https://doi.org/10.1346/CCMN.1999.0470203)

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