

Microfacies Analysis of the Paleocene Carbonate Rocks of Kala Chitta, Kohat-Potowar and Salt Range, Pakistan

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Abstract

The carbonate rocks of Paleocene age are mainly Lockhart Limestone, which is well exposed in different areas like Kala Chitta Range, Kohat-Potowar, and salt Range. The formation is mainly composed of medium to thick-bedded nodular limestone with intercalation of shales. For detailed study, the exposed referenced sections were measured and around 170 surface rock samples were collected from Salt range and Kala Chitta Range. More than 150 rock samples are utilized for microfacies analysis. The petrographic study of unstained and stained thin sections has been executed to examine its sedimentology, microfacies and diagenetic settings. Detailed field observations and laboratory investigations revealed that it contains eight (8) microfacies including Echinoderm Wackestone facie (MF1), Algal Lockhartia Wackestone facie (MF2), Lockhartia Wackestone facie (MF3), Operculina Grainstone facie (MF4), Ranikothalia Lockhartia Miscellaneous Packstone facie (MF5), Green algae Miscellaneous Grainstone facie (MF6), Bioclastic Wackestone facie (MF7), Coralgal wackestone facies (MF8).

The correlation of these microfacies from the two sections reveals that some of the facies are repeated at certain intervals showing cyclicity and these cycles are not common in each section. The lateral change of facies is also observed as the limestone changes into dolomitic limestone and in some cases into some shaly limestone. Internal parts of the allochems are replaced by spar while their skeletons are preserved. Calcite veins are also present which are filled by spar and partially with ferroan calcite. Dolomitic crystals are also present at certain intervals. The primary (intergranular) and secondary (fracture and moldic) porosity is also observed. The study also demonstrates the presence of various cement types, which indicates different stages of diagenetic processes. These diagenetic processes observed through thin section studies included micritic envelop, neomorphism, mechanical compaction, pressure solution, dolomitization, and different cement types. Microfacies analysis and diagenetic settings lead towards the conclusion that formation was deposited in shallow marine neritic environment with different diagenetic stages, which indicate good reservoir potential.