AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

John P. Grotzinger[1], Joachim E. Amthor[2] (1) Massachusetts Institute of Technology, Cambridge, MA (2) Petroleum Development Oman, Muscat, Oman

Facies and Reservoir Architecture of Isolated Microbial Carbonate Platforms, Terminal Proterozoic-Early Cambrian Ara Group, South Oman Salt Basin

Isolated carbonate platforms, of terminal Proterozoic to earliest Cambrian age, form prolific reservoirs within the intra-salt petroleum system of South Oman. The Ara Group represents at least six 3rd -order cycles of carbonate/evaporite sedimentation in a tectonically active basin. Each cycle contains several isolated carbonate platforms, with reservoirs developed according to primary facies distributions. Enclosing salts provide base and top seals. Ara platforms formed during transgressive to highstand accommodation conditions, superimposed upon a progressive, long-term accommodation increase which forced platforms within each cycle to occupy progressively less area. Older platforms are thinner and laterally more extensive, intermediate age platforms are thicker and more differentiated with respect to shelf margin and slope-to-basin facies, younger platforms are thinner again, often dominated by TST deeper-water facies, and the youngest consist of numerous small pinnacle reefs. Platform facies include microbial boundstones, intraclast-peloid-ooid grainstone-packstone, and mudstone. Microbial facies dominate, and display a variety of textures that conform to systematic variations in water depth and inferred accommodation regime. Platform interior facies consist of peritidal stratiform stromatolites with pustular, smooth, and tufted textures. These pass laterally into thrombolite sheet and mound facies, which pass downslope into turbiditic mudstones that interfinger with crinkly laminites in the most distal settings. Crinkly laminites are widespread in basinal settings and result from accumulation of both pelagic and benthic microbial organics. These basinal microbialites form one reservoir type whose performance deteriorates in proportion to the influx of turbiditic shelf-derived muds. Other reservoirs are developed principally in shelf interior to shelf margin microbialites and associated grainstones. Reservoir quality in microbialites reflects the primary (inefficient) growth fabric of thrombolites, and the early diagenetic decay of microbial mats in more stromatolitic facies.