

PITTMAN, EDWARD D., Amoco Production Co., Tulsa, OK

Effect of Cementation on Physical Properties of Sandstones

Cementation reduces porosity and permeability, and modifies pore geometry. Cementation also increases bulk density, compressive strength, tensile strength, modulus of elasticity, and sonic conductivity. These properties vary with the amount and type of cement as well as the location of cement, at least for small amounts of cement. Crystal growth at pore apertures has a pronounced influence on permeability, rock strength, and sonic conductivity. The amount, type, and nature of the cement affect wireline log response, upon which many decisions are based.

Major mineral cements in sandstones are quartz, carbonates (calcite, dolomite-ankerite, and siderite), clay minerals, anhydrite-gypsum, and zeolites. Growth habits, crystal shape, crystal size, and location of crystals within the pore system influence pore geometry. Tabular micropores commonly occur among the cement crystals. The nature of the cement affects tortuosity and rugosity.

PLAFKER, GEORGE, and GARY WINKLER, U.S. Geol. Survey, Menlo Park, CA, and GEORGE CLAYPOOL, U.S. Geol. Survey, Denver, CO

Geology of Continental Slope Adjacent to OCS Lease Sale 55, near Yakutat, Eastern Gulf of Alaska

Forty-two samples of probable outcrop dredged along the 250-km-long northwest-trending continental slope between long. 138°00'W and 142°30'W from water depths of 3,150 to 200 m provide control on the geology of the seaward margin of the Tertiary basin underlying the outer continental shelf (OCS) Lease Sale 55 on the Yakutat segment of the shelf.

Six rock units apparently in approximately normal stratigraphic position are tentatively recognized. (1) Hard graywacke, argillite, and possible intrusive rocks of inferred Late Cretaceous age crop out from Cross Sound to 139°W and probably underlie much of the Fairweather Ground. (2) 800+ m of shallow-marine basaltic flow and pyroclastic rocks, at least in part of early Eocene age, makes up much of the rugged lower slope from 139°W to about 141°30'W, and rocks of this type are sporadically present west of Yakutat Sea Valley. (3) 500+ m of shallow-marine fine to coarse clastics including organic-rich shale of early and middle(?) Eocene age overlies and intertongues with the volcanic unit from 139°30'W to 142°30'W. (4) 1,500+ m of upper to middle bathyal organic-rich shale, tuffaceous shale, and sandstone of late Eocene and early(?) Oligocene age, apparently overlies the older units between about 140°W to 141°30'W. (5) 450+ m of siltstone with sandstone of probable late Oligocene age underlies the upper slope between 139°W and 140°W. (6) Neogene marine glacial deposits and mud occur on the OCS as slope-basin fills and slope-rise prisms, and as a mantle over the slope at the mouths of the Alsek Canyon and Yakutat Sea Valley.

The lower Tertiary sequence sampled on the conti-

nental slope differs significantly from coeval rocks onshore or penetrated by wells on the Yakataga segment of the OCS to the west. The Eocene and Oligocene units sampled include abundant thermally mature source rocks. Most dredged sandstones are poor reservoirs, but some upper Eocene to lower Oligocene sandstones have fair to good porosity and permeability. Seismic reflection data indicate that the Eocene and Oligocene sequence dips beneath Lease Sale 55 where it could be a favorable exploratory target.

PLUMLEY, WILLIAM J., Chevron Oil Field Research Co., La Habra, CA

Effective Stress and Abnormally High Fluid Pressure

Published hypotheses of the causes of abnormally high fluid pressure have not explored explicitly the relation between the present effective stress (s_p) and the maximum effective stress (s_m) to which a sediment has been exposed during its history. In basins where sediments are at their maximum burial depth, the present effective stress can be used to evaluate quantitatively different hypotheses for abnormal fluid pressure development. The underlying assumption of this approach to hypothesis testing is that shale porosity is principally a function of maximum effective stress.

"Nonequilibrium compaction" as a cause of abnormally high fluid pressure requires that $s_p = s_m$ and predicts porosities that are higher than would be obtained if another cause, such as "aquathermal pressuring" or "clay transformation" (which require that $s_p < s_m$), were the predominant mechanism producing the same abnormally high fluid pressure. Observed porosities in Gulf Coast high-pressure shale formations commonly are too low to be solely the result of nonequilibrium compaction. In two field examples, shale porosities predicted with the nonequilibrium compaction model are about 20 porosity units higher than porosities determined from $\gamma - \gamma$ density logs and cores. In one example, a combined mechanism of nonequilibrium compaction and clay transformation is one possible, and internally consistent, interpretation of the fluid pressure and porosity data. In the other example, the fluid pressure and porosity data are consistent with clay transformation being the mechanism for the generation of the abnormally high fluid pressure, but are not consistent with the nonequilibrium compaction model.

POGORSKI, LOUIS A., and G. STEWART QUIRT, Chemical Projects Ltd., Toronto, Ontario

Helium Surveying for Deeply Buried Uranium Deposits

Helium emanometry is rapidly becoming a widely employed exploration tool in searching for deeply buried uranium deposits. It has been used in many uraniumiferous and potentially uraniumiferous regions including the Colorado Plateau, Texas Gulf Coast, Wyoming, Appalachian orogenic belt, Athabasca basin, and Canadian Northwest Territories.

Helium escaping from radioactive mineral deposits can be detected and serves as a guide to the location of uranium ore. This gas is an almost ideal geochemical indicator of uranium because it is inert, stable, slightly