ginia Univ., Morgantown, W.Va.

Petrographic Evaluation of West Virginia Coals for Coal Utilization Schemes

Proper evaluation of coals for utilization, whether it is to be combustion, carbonization, gasification, or liquefaction depends on a knowledge of the petrographic (maceral) composition of the coals in question. This petrographic study of West Virginia coals was designed to provide a basic knowledge of the composition of the state's coals, with specific reference to utilization. Compositional trends and their causal influences were evaluated.

Thirty major seams were quantitatively analyzed, and the data were displayed in histograms for interpretation of the resulting frequency distributions. The frequency distributions of the macerals were generally non-normal with minor macerals showing highly negatively skewed histograms, and major maceral distributions displaying bimodal characteristics.

Both areal and vertical stratigraphic trends were evident in the abundance of some macerals. Q-mode factor analysis related these trends in composition to metamorphism (rank), plant evolution, and sedimentary environments of peat deposition. The knowledge acquired on coal composition, its expected variation, and factors influencing composition can be applied to the evaluation of West Virginia coals for many utilization technologies.

HANSON, M. E., G. D. ANDERSON, R. J. SHAFFER, N. R. BURKHARD, and A. G. DUBA, Lawrence Livermore Lab., Livermore, Calif.

Theoretical and Experimental Analyses of Hydraulic Fracturing and Sonic Logging in Gas Shales

A joint theoretical/experimental research program on hydraulic fracturing, is being conducted. Newly developed numerical models have been applied to analyze some aspects of fracture propagation near well-bonded material interfaces to determine whether these interfaces can inhibit propagation. Results from these calculations indicate that, for fractures propagating from a lower modulus material toward an interface with a higher modulus material, the stress-intensity factor at the tip near the interface decreases significantly as the tip approaches the interface. However, upon penetration of the interfaces into the higher modulus material, the stress-intensity factor increases abruptly and arrives at a higher value than in the lower modulus material. Conversely, when the fracture is propagating from a higher modulus material toward a lower modulus material, the situation is reversed. The presence of fractures near the interface significantly reduces the effects of these phenomena. Dynamically, where wave-mechanics effects are taken into consideration, the change in material properties also affects fracture propagation across an interface.

Small-scale laboratory experiments are being performed to study the growth of hydraulically driven cracks in the vicinity of unbonded interfaces in rocks. Blocks of the materials being studied are held adjacent to one another under a static load, and a hydraulically driven crack is initiated in one of the blocks. For blocks of the same material, penetration of the crack into the adjacent block is controlled by the normal stress across the interface and the finish of the interface surfaces. Experiments have been performed to measure the frictional properties of the interfaces to understand better the mechanism of crack growth across the interface.

The LLL dry-hole sonic logging tool was applied in Columbia 20569 gas well, Mingo County, West Virginia. Although some problems were encountered in the application of the tool, data were collected and analyzed to locate reflection loci near the well bore at distances up to several meters.

HARRIS, LEONARD D., and KENNETH C. BAYER, U.S. Geol. Survey, Reston, Va.

Eastern Projection of Valley and Ridge Beneath Metamorphic Sequences of Appalachian Orogene

Surface and subsurface data from parts of the Appalachian Plateau, Valley and Ridge, Blue Ridge, Piedmont, and the continental shelf indicate that the Appalachian orogene is a broader feature than heretofore suggested. The orogene appears to form a continuous northeast-trending structural belt from Georgia to Canada, whose east-west dimension includes the area from the continental shelf to the limit of thrusting in the Appalachian Plateau. Seismic reflection data suggest that the entire southern part of the orogene is underlain by an eastward-dipping subhorizontal master decollement zone. Thus, the structural style of the orogene is dominated by subhorizontal thrusts that are characteristic of thin-skinned tectonics. Within the orogene, from Canada to Georgia, displacement on subhorizontal thrusts has moved eugeosynclinal sequences (metamorphic and igneous rocks) tens of kilometers westward, burying thick sequences (4,500 to 10,500 m) of Paleozoic miogeosynclinal rocks. Limited seismic data in North Carolina and Georgia suggest that miogeosynclinal sequences project eastward in the subsurface beneath thrust plates of eugeosynclinal rocks for at least 65 km. If the eastward projection of miogeosynclinal rocks in the subsurface of North Carolina and Georgia is representative of the entire Appalachian orogene, there may be a concealed belt of Paleozoic miogeosynclinal rocks on the order of the present length and width of the Valley and Ridge. Future exploration programs for hydrocarbons within the Appalachian orogene should give careful consideration to this vast untested and unknown area.

HENKLE, WILLIAM R., JR., Consulting Geologist, Denver, Colo.

New River Formation Coals in Southern Boone and Northern Logan Counties, West Virginia—Possible New Coal and/or Methane Resource

Porosity logs run in uncased sections of oil and gas wells in Boone and Logan Counties, West Virginia, indicate that several potentially minable coal beds are present in the lower coal measures. Geophysical-log correlations indicate that the New River Formation may contain continuous, minable coals, at developable