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Trenton Group of New York State

The carbonate bank deposits of New York state's Trenton Group have been studied for nearly 150 yr. Curiously, it has been only recently that the facies patterns of the unit have been recognized. These facies patterns reveal that Trentonian epeirogeny was closely related to the regional inversions of topography that occurred at the beginnings of the Vermontian and Hudson Valley phases of the Taconic orogeny that was occurring in nearby New England. Each inversion resulted in a subsidence of the Trenton platform and an abrupt westward migration of the black shale facies derived from uplifting source lands.

Trentonian deposition began with the Vermontian phase. Carbonate-producing seas flooded onto a subsiding New York. The Napanee, Kings Falls, Sugar River, and lower Denley Limestones represent that transgression. At the same time, the shale facies migrated westward as far as Utica.

During the middle Trentonian, downwarping slowed markedly. Deposition was rapid enough to produce a shallowing facies pattern in the upper Denley and lower Steuben Limestones. During this time, the shale facies made no further westward advance.

The Hudson Valley phase began with a second, more intense, topographic inversion that would end Trentonian deposition. The upper Steuben and Hillier Limestones record a rapid subsidence. A brief, but puzzling, unconformity overlies the Trenton Group. Then, a final westward migration of the clastic facies buried the Trenton platform.

Thus, the upper and lower Trentonian strata were deposited in remarkably similar tectonic settings. The Vermontian phase initiated Trentonian deposition; the Hudson Valley phase brought that carbonate deposition to a close.

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Petrographic Characterization of Coals in Kozlu and Kilic Formations (Westphalian A), Zonguldak, Turkey

The Zonguldak coal region is about 130 km (80 mi) long and 30-50 km (18-31 mi) wide and is situated on the southwest coast of the Black Sea. The basin is the main bituminous coal-producing region of Turkey. It has a complicated faulted structure.

The Carboniferous of the Zonguldak region consists of three natural divisions: Alacaagzi (Namurian), Kozlu and Kilic (Westphalian A), and Karadon (Westphalian B, C, and D). The main concern of this study is the Kozlu and Kilic Formations, which have about 31 coal seams with a total thickness of 45 m (150 ft) of coal.

Estimated bituminous coal reserves in Turkey are 1.3 billion MT; about 5 million MT are produced each year and are used mainly for steel making. The coals have a high volatile and ash content. They are high volatile bituminous coals by the ASTM (American Society for Testing Materials) classification.

The coals show semi-bright luster and very fine banding. Clarain, fusain, and durain are common lithotypes; the predominant lithotype is vitrinous clarain. Few thick vitrain bands are present. Some Turkish bituminous coals contain a very high percentage of mineral matter. Clay minerals, pyrite, and calcite are the most common.

Ninety polished samples were taken from three different locations—Karadon, Uzulmez, and Kozlu—and analyzed under a reflected light microscope with oil immersion objectives.

The Turkish bituminous coals exhibit a complex combination of macerals and microlithotypes. Vitrinite is the most abundant maceral type, and exinite is the least abundant. The presence of a high amount of inertinite macerals and duroclarite as well as virtinertite microlithotypes suggests a lacustrine depositional environment for the coals. Successive coal seams, or even a single coal seam, indicate transgressions and regressions. Turkish bituminous coals match the properties of the Pictou coalfield coals in Canada and the Gondwana coals of South Africa, India, and Australia.

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Hydrocarbon Entrapment in Trenton of Southern Ontario

Middle Ordovician Trenton strata in southern Ontario are represented by a generally transgressive sequence that reflects a wide spectrum of carbonate environments from tidal flat, through lagoon and shoal, into deeper shelf carbonates. The Trenton conformably overlies the shallow water carbonates of the Black River and is unconformably overlain by the gray-black noncalcareous shales of the Blue Mountain Formation.

Virtually all Ordovician production in Ontario is associated with structural deformation related to rejuvenation of a Precambrian fracture framework triggered by orogenic events in the nearby Appalachian orogene. The reservoirs are characterized by the replacement of original bioclastic limestone beds by more or less discontinuous lenses of fine to medium-grained, light to medium-brown crystalline dolostone. Pools generally are linear, following the trend of the associated fracture.

Six of the 18 known Ordovician pools in Ontario are located in Essex County. A detailed study of the geology and reservoirs confirmed the close association of fracturing, dolomitization, and hydrocarbon entrapment. Representative samples of well cuttings from 20 wells were analyzed by XRD (x-ray defraction) to determine calcite-dolomite ratios. As expected, low ratios were present in the producing reservoirs. Partially dolomitized zones were revealed in wells in close proximity to fractures. Formation water originating in the underlying Cambrian sandstones was probably the main dolomitizing agent as it migrated up through the fracture. Dolomitization enhanced already existing porosity within the bioclastic zones.

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Nature of Petrographic Variation in Taylor-Copland Coal of Middle Pennsylvanian Breathitt Formation of Eastern Kentucky

The Taylor-Copland Coal is petrographically distinctive in that it has lowest average vitrinite content (63%) and concomitant highest inertinite (25%) and exinite (12%) of all eastern Kentucky coals. Additionally, average total sulfur is 3.4%, or nearly twice the 1.8% figure determined for all eastern Kentucky samples. Deviations from the maceral averages are equally distinctive. Particularly interesting is an areally extensive, though discontinuous, sample sequence showing significantly lower vitrinites (commonly 40%), very high inertinites (40%), and high exinite content (15-20%). This "high inertinite" trend is traceable over an east-west linear distance of at least 20 mi (32 km), is occasionally interrupted along trend by samples having higher than average vitrinite, and probably disappears completely southward where coals with high vitrinite–lower inertinite contents prevail.

The high-inertinite and high total-sulfur trends and variations for each were presumed to be related to proximity to the coal of marine lithologic units of the overlying Magoffin Member. However, it was found that maceral and possible sulfur trends are probably unrelated to roof rock variation, but are related to existence or absence of a thick durain coal lithotype toward the middle of some coal beds. When present, the durain is commonly interspersed with fusain and/or pyrite bands or lenses, and is microscopically observed to be enriched in inertinite-exinite.

Palynology reveals that spores in the durain-rich samples are poorly preserved (micrinitized), but assemblages and relative percentages of genera forming the assemblages remained unchanged from those found in high-vitrinite (durain-free) samples. Unchanged spore assemblages possibly indicate that unchanging plant communities existed through the durain-forming episode of the Taylor-Copland swamp. Rather, the effect of the durain phase on the Taylor-Copland swamp was to accelerate degradation (oxidation) of peat deposits associated with the surrounding plant community. The durain deposit is thought to have accumulated within an encroaching brackish-marine water system. This influx may have represented an early, short-lived pulse of the same advancing marine system that ultimately produced the extensive overlying Magoffin deposits.

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Application of Vitrinite Reflectance to Interpret Gas Content, Maximum Depth of Burial, and Paleogeothermal Gradient of Coal Beds in Dunkard Basin