The Role of Moldic Porosity in Paleozoic Kansas Reservoirs and the Association of Original Depositional Facies and Early Diagenesis With Reservoir Properties

Alan P. Byrnes, Evan K. Franseen, W. Lynn Watney, and Martin K. Dubois
Kansas Geological Survey, 1930 Constant Ave., Lawrence, KS 66047

Purpose

- To better understand the nature and distribution of moldic porosity in reservoir-quality sandstone formations
- To evaluate the role of original depositional facies and early diagenetic processes in controlling reservoir properties
- To enhance modicity and moldic porosity, and more broadly, petroleum resource potential in Paleozoic reservoirs

Importance of Moldic Reservoirs to Kansas Oil and Gas Production

Kansas reservoirs have produced nearly 3.1 trillion barrels of oil and gas, with a significant portion of this production coming from moldic porosity. The Iola Member of the Illini formation, specifically the upper 100 feet of the Member, has been particularly important, with the Kansas Geological Survey estimating that 35% of the oil and gas produced from Kansas is from this interval. The moldic porosity in this interval is primarily due to early diagenetic processes, particularly microbial activity associated with the deposition of the Illini formation.

Generalized Paragenetic Sequence

- Early diagenetic processes
  - Diagenetic cementation
  - Organic matter成熟
g- Early moldic porosity development
- Late diagenetic processes
  - Compaction
  - Dissolution

Murfins Drilling #2 CO2 I-1: 2985-2914 ft

General Lansing-Kansas City Geologic Setting

- Cosmopolitan strata of the uppermost Mississippian, lowermost Pennsylvanian
- Includes fluvial, deltaic, and marine facies
- Reservoir quality is controlled by the interplay of depositional and diagenetic processes

Important Microscopic Textures

- Moldic porosity
  - Produced by early diagenetic processes
  - Associated with organic maturation
- Early quartz overgrowth
  - Produced by early diagenetic processes
  - Calcareous cements
  - Detrital quartz cements

Correlation of Textural Properties with Permeability

- Permeability is positively correlated with the degree of moldic porosity
- High permeability is associated with high moldic porosity
- Low permeability is associated with low moldic porosity

Panel 1

- Diagrams illustrating the relationship between textural properties and permeability
- Graphs showing the correlation between permeability and moldic porosity

Panel 2

- Diagrams illustrating the relationship between textural properties and permeability
- Graphs showing the correlation between permeability and moldic porosity