THE SEDIMENTARY PETROGRAPHY OF THE DEVIL'S KITCHEN MEMBER IN THE ARDMORE BASIN

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The Devil's Kitchen member of the Deese formation forms a ridge along the flanks of the Caddo and Overbrook anticlines which lie to the north and south of Ardmore, Oklahoma. These folds are the predominant structures of the Ardmore Basin of south central Oklahoma.

The Devil's Kitchen member, approximately 500 feet in thickness, is composed of an upper and a lower sandstone separated by an interval of shale. The lower sandstone is buff in color and varies from 100 to 200 feet in thickness. The middle shale is about 190 feet in thickness near the south end of Lake Murray. The upper sandstone, white to buff in color, reaches a thickness of 225 feet in the same locality. It contains chert grains which gradually increase to conglomeratic size as the bed is traced southeast from Ardmore.

The present investigation was initiated for the purpose of assembling and interpreting data pertaining to the mineral composition, the size analysis, and the probable source areas of these Pennsylvanian (Des Moines) sandstones. Sixty compound samples were collected and subjected to standard laboratory procedure. Both light and heavy minerals were studied in detail. The sieve analysis of each sample was plotted on semilogarithmic paper in cumulative curves and the commonly used statistical parameters were obtained from the study of these curves. The results are summarized below:

BED	MEDIAN	SORTING-SO	SKEWNESS-SKG
Upper DK	0.166 mm.	1.30	0.999
Lower DK	0.143 mm.	1.25	0.996

Light minerals were composed largely of quartz, with a minor amount of feldspar and chert. A detailed study of the inclusions in the quartz grains, following the works of Mackie and Tyler (2), indicates an ultimate source in an igneous terrane.

Heavy minerals which were found to have a wide distribution and to be common to the entire Devil's Kitchen member were: leucoxene, opaque minerals (not differentiated), tourmaline, zircon, garnet, staurolite, and rutile. Other minerals which have a sporadic occurrence include titanite, hypersthene, and barite.

Tourmaline, composing 13.7% of the heavy minerals, was studied in great detail. The tourmaline classification of Krynine (1) was applied to the study of these grains. Results indicated that these sandstones were formed for the most part from reworked sediments.

This study seems to support the following conclusions:

1. More than 94% of both the upper and lower sandstones, excluding conglomeratic phases of the upper bed, is composed of fine and very fine sand. The upper sandstone is slightly coarser than the lower, and both are well sorted.
2. Quartz is the major constituent of the sandstones, and feldspar composes 4% of the light minerals in the very fine sand.
3. Leucoxene and opaques compose over 65% of the heavy minerals. Tourmaline and zircon are about equal in quantity and comprise three-fourths of the remaining portion of the heavies. Garnet, rutile, and staurolite complete the suite.

4. These sandstones were derived largely from pre-existing sedimentary rocks, but crystalline rocks, both igneous and metamorphic, must have supplied some material. This is inferred in part from the special study of tourmaline. Quartz containing fluid and a few needle inclusions indicates an ultimate source of granitic rocks.
5. These sandstones must have been deposited in a shallow marine environment.
6. Arbuckle Mountain erosion must not have penetrated to the Pre-Cambrian granites at the time these sandstones were deposited.
7. Provenance areas to the southeast are suggested.

LITERATURE CITED

1. Krynine, Paul D. 1946. Tourmaline Group In Sediments. J. Geol. *54* (2): 65-87.
2. Tyler, Stanley A. 1936. Heavy Minerals in the St. Peter Sandstone in Wisconsin. J. Sedimentary Petrol. *6*: 55-84.