Jour. Korean Inst. Mining Geol.
Vol. 18, No. 3, p. 277-288, 1985

Analyses of Mineral Composition and Grain Size of the Sandstones from the Daedong Group*

Kang Min Yu**

Abstract: Mineral composition and grain size analyses of the sandstone from the Early Jurassic Daedong Group distributed in Mungyeong, Daecheon, Kimpo and Yeoncheon areas were made for the study of provenances and depositional environments. The most of the analyses are obtained from Mungyeong area, with some preliminarly works from Daecheon, Kimpo and Yeoncheon areas.

All sandstones from the study area are characterized by high content of quartz ranging from 59.8 to 87.2 percent of total constituents. Many of quartz which has rounded dust ring seems to come from aeolian sediments. Content of feldspar is very low except Daecheon area where it ranges from 1.8 to 10.0 percent. Sandstones from Mungyeong, Kimpo and Yeoncheon areas are classified as quartz and quartzose arenite/wacke, while those from Daecheon area are classified as quartzose and lithic arenite/wacke. According to the character of the sandstones, provenance could be quartzose sandstone and quartzite.

Results of grain size analysis of C-M and sorting versus skewness suggest that depositional environment seems to be fluvial, while log-probability curve pattern lacustrine environment. It is hard to derive a definite conclusion of sedimentary environment by the grain size analysis.

INTRODUCTION

Sandstones have been used as an important material for the interpretation of provenances and depositional environments.

Composition of sandstone is influenced by the character of sedimentary provenance, the nature of the sedimentary processes within the depositional basin, and the kind of dispersal paths that link the provenance to basin (Dickinson and Suczek, 1979). Grian size analysis of sandstones is a considerably important for the study of sedimentary environments. Numerous papers have been published about mineral composition and grain size since 1900s (Udden, 1914; Wentworth, 1922; Pettijohn, 1954; Dickinson, 1970; Blatt, 1967a: Yu, 1983). Nevertheless, there is only a few paper on the study of sandstones of Daedong Group.

The purpose of this study was to determine the provenance and depositional enironments by using mineral composition and grain size analyses, and to clarify the character of the sandstones of Daedong Group.

I wish to express my sincere thanks to Bok Chul Kim who helped the counting on thin section and field work. I am also grateful, to Misters Nam Soo Kim, UI Sung Yi and Shin Mok Kang for their help in many ways. Special thanks are due to Professor Kyung Duck Min and Dr. Jong Hwan Han, who kindly read and criticized the manuscript. This research was financially supported by the Ministry of Eduction, Korea.

METHODS AND MATERIALS

Sandstones were sampled from four different

* This paper was presented at the '85 Summer Syposium, the Korean Federation of Science and Technology Societies.
** Department of Geology, College of Science, Yonsei University Seoul, Korea

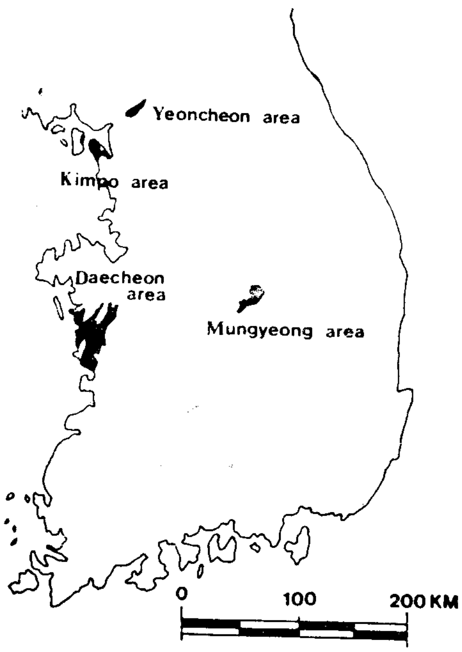

Fig. 1 Locality map of four different study area. i.e.; Mungyeong, Daecheon, Kimpo and Yeoncheon area.

areas, i.e., Mungyeong, Daecheon, Kimpo and Yeoncheon areas(Fig. 1).

Sampling localities are shown in Fig. 2, Fig. 3, Fig. 4, and Fig. 5. Samples whose numbers are 1 to 44, 45 to 50, 51 to 54, and 55 came from Mungyeong, Daecheon, Kimpo and Yeoncheon areas, respectively.

Sandstone samples were collected with the standard orientation, and a total of 55 thin

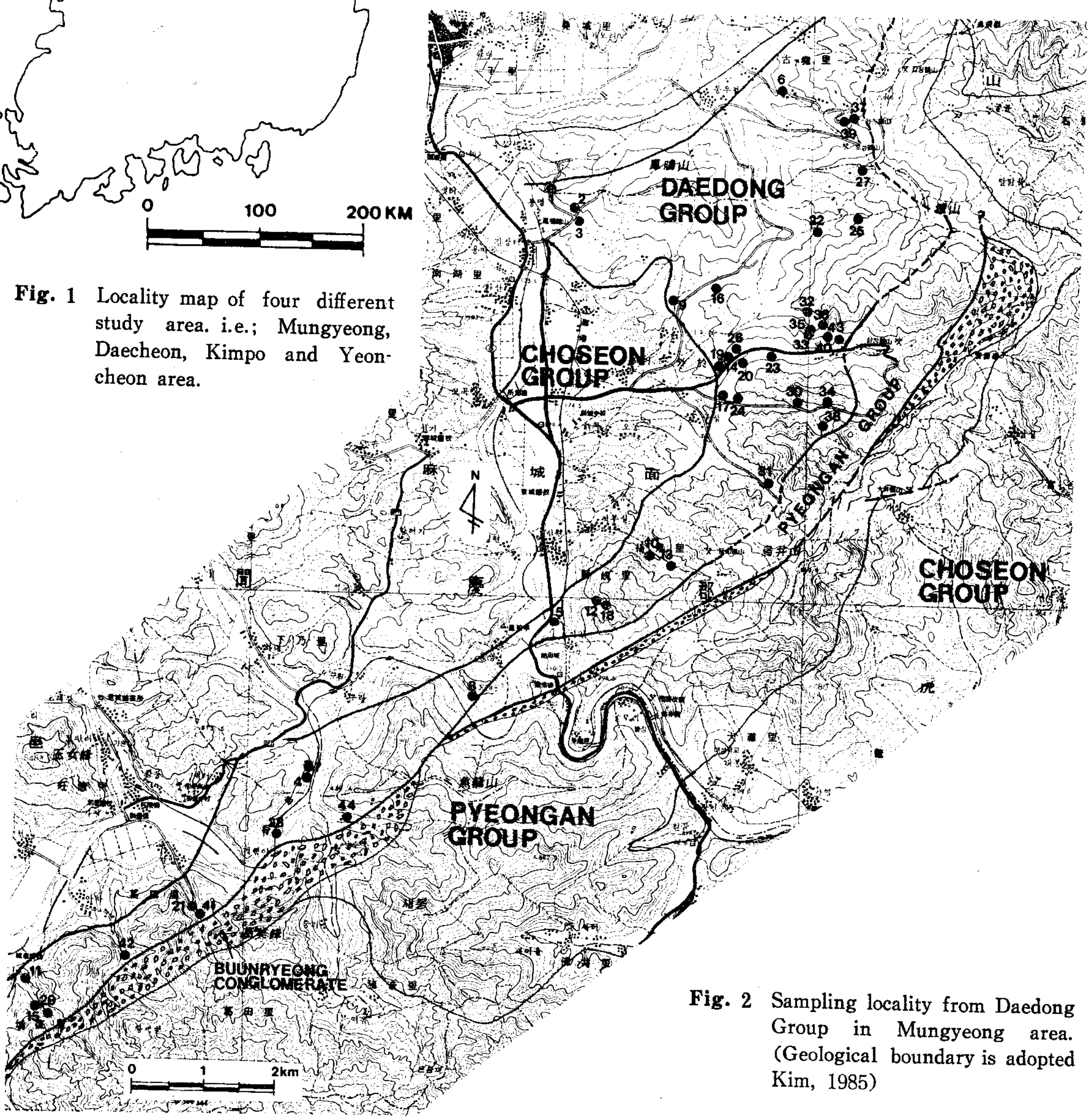

Fig. 2 Sampling locality from Daedong Group in Mungyeong area. (Geological boundary is adopted Kim, 1985)

sections were made paralled to the bedding.

Mineral composition were observed on thin sections of thirty five from Mungyeong, six from Daecheon, four from Kimpo and one from Yeoncheon area. The staining method using sodium cobaltinitrite(Bailey and Stevens, 1960; Norman, 1974) was applied for the distinction of plagioclase and potash feldspar.

Mineral composition analysis was carried out by the modal point count of 500 points with an interval of 0.5mm. In this study, classification of sandstone follows Okada's classification

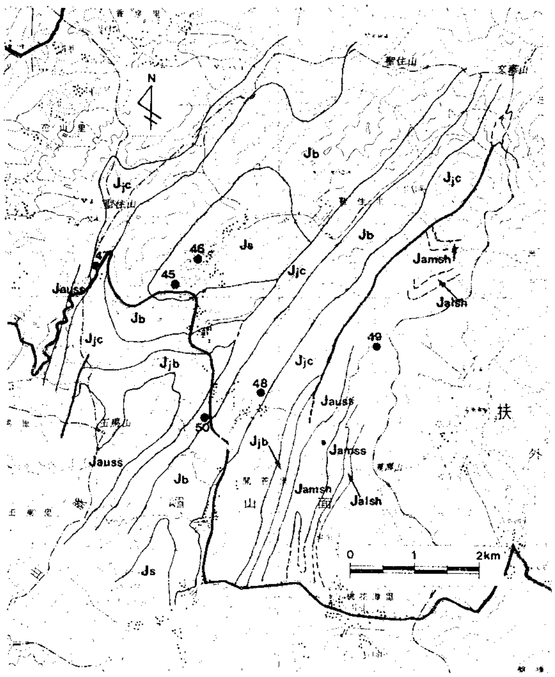

Fig. 3 Sampling locality from Deadong Group in Daecheon area. (Geological boundary is adopted Suh et al., 1980)
Seongjuri Formation(Js)
Baegunsa Formation(Jb)
Jogeri Formation
conglomerate zone(Jjc)
feldspar breccia bearing sandstone zone(Jjb)
Amisan Formation
upper sandstone zone(Jauss)
middle shale zone(Jamsh)
middle sandstone zone(Jamss)
lower shale zone(Jalsh)
lower sandstone zone(Jalss)

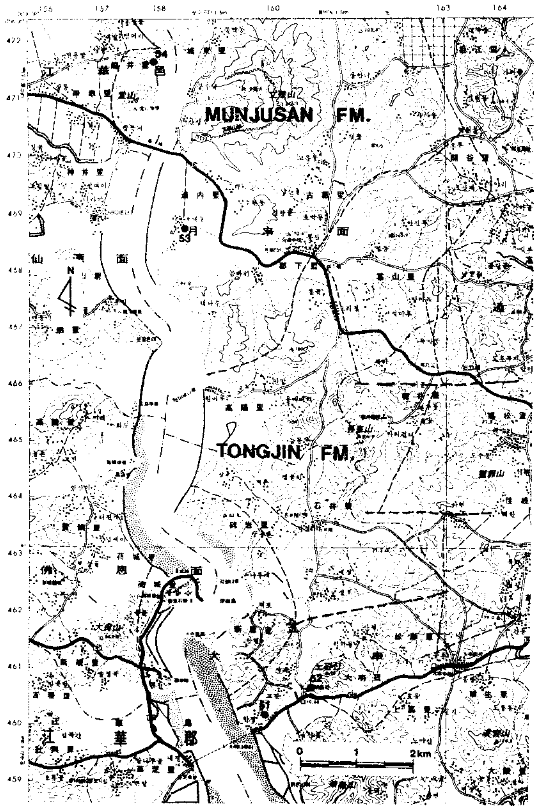

Fig. 4 Sampling locality from Daedong Group in Kimpo area. (Geological boundary is adopted Thomas et al., 1976)

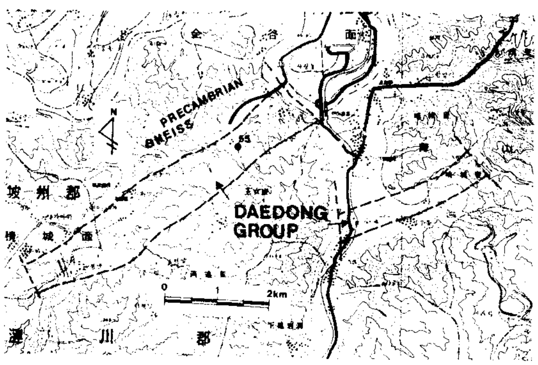

Fig. 5 Sampling locality from Daedong Group in Yeonchon area. (Geological boundary is adopted Thomas et al., 1976)

(Okada, 1971). Fifteen percent matrix is adopted for critical point classifying arenite and wacke. Polycrystalline quartz which is aggregates of quartz crystal was divided into two categories, i.e., finely and coarsely polycrystalline quartz,

Table 1 Mineral composition of sandstones from study area, i.e.; Mungyeong(1～44), Daecheon(45～50), Kimpo(51～54) and Yeoncheon(55) area.

Area	No.	Mono Qz	Poly Qz1	Poly Qz2	Total Qz	Plag	K-Fd	Total Fd	Granite	Acid Vol Rock	Chert	Sandstone	Shale	Other Rock Fragment	Toal Rock Fragment	Accessory Mineral	Matrix	Q/(F+R)	F/R
Mungyeong	1	42.4	5.6	27.4	75.4	—	—	—	—	—	—	—	1.8	6.4	8.2	1.4	15.0	9.20	0.00
	2	39.8	16.0	17.6	73.4	—	—	—	—	—	—	—	1.2	5.2	6.4	1.2	19.0	11.47	0.00
	3	38.8	13.0	34.2	86.0	—	—	—	—	—	—	0.2	—	1.0	1.2	0.6	12.2	71.67	0.00
	6	46.8	15.0	8.4	70.2	1.8	—	1.8	—	—	0.2	0.6	—	3.6	4.4	0.2	23.4	11.32	0.41
	7	68.6	5.6	12.4	86.6	0.6	—	0.6	0.4	—	0.2	—	—	0.2	0.8	0.2	11.8	61.86	0.75
	8	57.4	1.2	1.2	59.8	2.4	0.6	3.0	0.2	1.0	3.0	—	0.6	11.0	13.4	1.0	22.8	3.65	0.22
	9	49.8	7.4	24.4	81.6	2.6	0.2	2.8	—	—	—	—	—	3.6	3.6	0.4	11.6	12.75	0.78
	11	69.8	0.4	8.4	78.6	tr	—	tr	tr	—	1.2	—	—	2.2	3.4	0.8	17.2	23.12	0.00
	12	77.4	0.6	9.2	87.4	1.6	—	1.6	0.2	—	1.2	—	—	1.4	2.8	0.4	8.0	19.86	0.57
	13	69.0	0.2	15.2	84.4	tr	—	tr	—	—	1.0	—	—	0.8	1.8	2.8	11.0	46.89	0.00
	15	59.0	0.8	10.4	70.2	0.6	—	0.6	—	—	1.8	—	1.2	2.8	5.8	0.6	22.8	10.97	0.10
	16	65.6	1.8	10.6	78.0	3.0	—	3.0	—	—	—	—	—	2.6	2.6	0.4	16.0	13.93	1.15
	17	62.0	4.2	5.0	71.2	3.6	—	3.6	—	—	0.6	0.2	0.8	4.6	6.2	1.0	18.0	7.27	0.58
	18	73.8	—	3.8	77.6	1.4	—	1.4	—	0.2	0.8	—	—	1.0	2.0	0.6	18.4	22.82	0.70
	19	71.8	3.2	1.2	76.2	4.0	—	4.0	0.4	0.2	1.0	—	0.2	1.6	3.4	0.8	15.6	10.30	1.18
	21	65.2	0.4	2.4	68.0	0.2	—	0.2	—	—	0.8	—	—	0.8	1.6	0.6	29.6	37.78	0.13
	22	85.0	—	—	85.0	1.6	—	1.6	—	0.2	—	—	—	2.6	2.8	—	10.6	19.32	0.57
	23	46.2	14.6	14.0	74.8	0.8	—	0.8	0.2	0.8	0.6	0.8	0.8	3.8	7.0	4.0	13.4	9.59	0.11
	24	67.0	1.0	7.6	75.6	2.4	—	2.4	0.2	0.8	1.2	0.4	—	1.6	4.2	7.4	10.4	11.45	0.57
	25	64.4	1.2	17.8	83.4	1.4	—	1.4	0.4	—	—	—	—	1.2	1.6	1.8	11.8	27.80	0.88
	26	44.2	13.2	13.0	70.4	1.6	—	1.6	—	2.0	2.0	1.6	1.6	2.6	9.8	0.2	18.0	6.18	0.16
	28	66.2	2.6	8.4	77.2	1.4	—	1.4	0.2	2.8	1.4	1.0	—	0.2	3.6	0.4	17.4	15.44	0.39
	29	64.2	2.2	13.6	80.0	1.2	—	1.2	—	—	2.6	—	—	0.4	3.0	0.4	15.4	19.05	0.40
	30	52.6	6.8	8.0	67.4	1.2	—	1.2	0.4	7.8	2.2	1.8	0.4	2.0	14.6	0.8	16.6	4.27	0.08

Table 1 Continued.

Area	No.	Mono Qz	Poly Qz1	Poly Qz2	Total Qz	Plag	K-Fd	Total Fd	Gra-nite	Acid Vol Rock	Chert	Sand-stone	Shale	Other Rock Frag-ment	Total Rock Frag-ment	Acce-ssory Mineral	Matrix	Q/(F+R)	F/R
Mungyeong	31	68.4	2.0	9.0	79.4	3.6	—	3.6	2.0	1.6	0.6	0.4	—	1.0	5.6	1.0	10.4	8.63	0.64
	32	52.0	8.0	16.6	76.6	3.8	—	3.8	1.0	1.2	1.6	—	—	0.4	4.4	0.8	14.4	9.34	0.86
	34	54.8	3.4	13.4	71.6	1.4	—	1.4	0.2	0.8	1.2	—	0.8	2.4	5.4	1.0	20.6	10.53	0.26
	35	57.0	6.2	15.8	79.0	2.0	—	2.0	0.8	0.4	0.4	0.4	—	1.8	3.8	0.4	14.8	13.62	0.53
	36	65.2	11.0	11.0	87.2	1.0	—	1.0	0.4	—	—	3.8	—	0.4	4.6	0.8	6.4	15.57	0.22
	38	67.6	2.2	7.0	76.8	0.6	—	0.6	—	1.4	1.8	1.0	—	2.2	6.4	1.2	15.0	10.97	0.09
	39	70.2	1.8	4.6	76.6	1.0	—	1.0	0.4	—	1.0	0.4	—	3.8	5.6	1.2	15.6	11.61	0.18
	40	52.4	5.6	12.8	70.8	0.4	—	0.4	—	—	2.4	9.6	—	2.2	14.2	0.8	13.8	4.85	0.03
	42	64.0	—	7.2	71.2	tr	—	tr	—	—	2.2	—	—	3.4	5.6	2.4	20.8	12.71	0.00
	43	43.2	4.6	23.8	71.6	6.0	—	6.0	0.6	—	1.0	—	—	0.2	1.8	0.8	19.8	9.18	3.33
	44	53.8	2.6	16.4	72.8	5.0	—	5.0	1.0	0.2	0.8	—	—	0.2	2.2	2.0	18.0	10.11	2.27
Daecheon	45	41.0	4.4	10.0	55.4	4.0	3.4	7.4	2.0	1.2	0.8	0.4	1.8	8.4	14.6	2.8	19.8	2.52	0.52
	46	52.0	2.8	7.6	62.4	7.0	3.0	10.0	0.8	2.2	2.0	0.4	1.0	5.8	12.2	0.8	14.6	2.81	0.82
	47	52.6	9.2	5.6	67.4	4.2	—	4.2	1.0	1.2	0.8	0.4	2.4	7.2	13.0	1.6	13.8	3.92	0.32
	48	54.2	4.8	11.8	70.8	1.6	0.2	1.8	—	—	1.6	—	—	0.4	2.0	1.0	24.4	18.60	0.90
	49	65.2	2.2	5.4	73.8	4.8	4.2	9.0	—	—	0.8	—	1.0	0.6	2.4	0.6	14.2	6.47	3.75
	50	59.0	5.8	10.2	75.0	2.6	3.0	5.6	—	—	0.6	—	0.4	—	1.0	0.4	16.6	11.40	5.60
Kimpo	51	58.8	1.6	5.0	65.4	7.0	—	7.0	—	—	1.2	—	1.0	—	2.2	0.4	25.0	6.67	3.18
	52	59.0	0.8	8.6	68.4	1.4	0.4	1.8	—	—	1.8	—	1.2	—	3.0	1.0	25.8	14.25	0.60
	53	55.6	3.8	12.6	70.2	—	—	—	—	—	0.8	—	0.4	—	1.2	0.6	26.2	58.50	0.00
	54	67.2	4.6	3.0	74.8	0.3	0.2	1.0	—	—	1.2	—	0.6	—	1.8	1.6	20.8	26.70	0.56
Yeoncheon	55	20.8	10.4	45.8	77.0	3.2	1.0	4.2	0.6	—	0.2	—	—	0.8	1.6	0.4	16.8	13.30	2.63

Qz1 : finely polycrystalline quartz
Qz2 : coarsely polycrystalline quartz
tr : trace

based on 3ϕ(0.125mm) aggregated quartz crystal.

Grain size analysis was made on thin section of the same sandstone samples for the mineral composition analysis and nine additional sandstone samples from Mungyeong area. Parameters of grain size analysis are deduced from modal point count of 500 points with 0.5mm interval each. Median($\phi 50$), Phi 1($\phi 1$), Phi 16($\phi 16$) and Phi 84($\phi 84$) were obtained from the cumulative probability scale. Mean($M\phi$) sorting ($\delta\phi$), and skewness($\alpha\phi$) were calculated from Inman(1952) method, that is, $M\phi=\frac{\phi 16+\phi 84}{2}$, $\delta\phi=\frac{\phi 84-\phi 16}{2}$, and $\alpha\phi=\frac{M\phi-Md\phi}{2}$. Grains smaller than 5ϕ(0.31mm) in maximum length are treated as matrix. The analytical procedure of C-M, sorting-skewness diagrams and log-probalility curves were basically analyzed by the standard method of Passega(1957), Friedman (1961, 1967) and Visher(1965, 1969).

The C-M patterns are generally used to interpret transportation mechanism of ancient sediments. Sorting versus skewness diagram distinguishes beach sands which are negative skewness and good sorting from river sands which are generally positively skewed and less well sorted.

Log-probability curves reflect three different modes of sediment transport, i.e., suspension, satlation, and traction. Specific distribution patterns of log-probability curves are related to sedimentary environments.

Mineral composition and grain size analyses of sandstones could represent characters of clastic sediments.

Data of mineral composition and grain size analyses are listed in Table 1 and Table 2.

RESULTS AND DISCUSSION

Result of mineral composition analysis of sandstone samples from four different areas are listed in Table 1.

In Mungyeong area, quartz content ranges from 59.8 to 87.2 percent of the total cons-

Table 2 Grain size parameters of sandstones from study area, i.e.; Mungyeong(1~44), Daecheon (45~50), Kimpo(51~54) and Yeoncheon(55) area.

Area	No.	Phi 1	Phi 16	Median Phi	Phi 84	Mean Phi	Sorting	Skewness	Matrix 2	Roundness
Mungyeong	1	0.78	1.10	1.57	1.90	1.50	0.40	−0.18	12.6	.4~.6
	2	0.70	1.23	1.78	2.21	1.71	0.49	−0.14	17.0	.4~.6
	3	0.10	0.83	1.46	1.98	1.41	0.58	−0.10	7.2	.4~.5
	4	0.55	0.96	1.49	1.92	1.44	1.48	−0.10	11.4	.5~.7
	5	1.40	1.99	2.40	2.69	2.34	0.35	−0.17	18.4	.4~.5
	6	0.50	0.99	1.51	1.82	1.41	0.42	−0.25	18.2	.4~.6
	7	−0.89	−0.10	0.85	1.04	0.47	0.57	−0.19	8.0	.4~.6
	8	−0.20	0.79	1.22	1.71	1.25	0.46	0.07	17.2	.4~.6
	9	−0.70	0.32	0.75	1.35	0.84	0.52	0.17	7.2	.4~.6
	10	1.08	1.66	1.85	2.22	1.94	0.28	0.32	13.2	.4~.6
	11	−0.67	0.46	0.88	1.35	0.91	0.45	0.06	13.6	.4~.6
	12	−0.40	0.42	0.92	1.50	0.96	0.54	0.07	5.4	.4~.6
	13	−0.58	0.10	0.70	1.30	0.70	0.60	0.00	6.0	.4~.6
	14	1.40	2.02	2.45	2.79	2.41	0.39	−0.12	22.2	.4~.6
	15	−0.90	0.02	0.60	1.45	0.74	0.72	0.19	16.2	.4~.6
	16	0.50	1.09	1.54	2.05	1.57	0.48	0.06	13.0	.5~.6

Table 2 Continued.

Area	No.	Phi 1	Phi 16	Median Phi	Phi 84	Mean Phi	Sorting	Skew-ness	Matrix 2	Roundness
Mungyeong	17	0.35	0.98	1.60	1.97	1.48	0.50	−0.25	14.8	.4～.6
	18	−0.22	0.66	1.07	1.60	1.13	0.47	0.13	13.2	.5～.6
	19	0.30	1.14	1.55	1.90	1.52	0.38	−0.08	17.2	.4～.6
	20	0.35	0.90	1.49	1.83	1.37	0.47	−0.27	13.6	.4～.6
	21	0.20	1.22	1.60	2.22	1.72	0.50	0.24	26.0	.4～.6
	22	−0.70	0.99	1.49	2.20	1.60	0.61	0.71	8.6	.5～.6
	23	−0.47	0.32	0.85	1.38	0.85	0.53	0.00	11.6	.4～.6
	25	−0.74	0.69	1.19	1.68	1.19	0.50	−0.01	8.0	.4～.6
	26	0.10	0.48	0.80	1.42	0.95	0.47	0.32	20.4	.4～.6
	27	1.50	1.92	2.38	2.70	2.31	0.39	−0.18	23.8	.4～.6
	28	0.15	0.71	1.10	1.48	1.10	0.39	−0.01	18.2	.4～.6
	29	−1.10	−0.32	0.45	1.14	0.41	0.73	−0.06	11.0	.4～.5
	30	−0.56	0.26	0.72	1.25	0.76	0.50	0.07	12.0	.4～.6
	31	−0.23	0.38	0.80	1.26	0.82	0.44	0.05	12.2	.4～.5
	32	0.00	0.65	1.16	1.50	1.08	0.43	−0.20	14.4	.4～.5
	33	1.45	1.68	1.95	2.39	2.04	0.36	0.24	14.4	.4～.6
	34	0.25	0.70	1.14	1.67	1.19	0.49	0.09	21.8	.4～.5
	35	−0.48	0.60	1.05	1.50	1.05	0.45	0.00	13.0	.4～.6
	36	−0.52	0.30	0.81	1.42	0.86	0.56	0.09	7.0	.4～.6
	37	0.72	1.15	1.66	1.88	1.52	0.37	−0.40	12.8	.4～.6
	38	−0.16	0.52	1.03	1.50	1.01	0.49	−0.04	16.8	.4～.5
	39	−0.52	0.56	1.25	1.65	1.11	0.55	−0.27	14.2	.4～.6
	40	0.06	1.13	1.60	2.02	1.58	0.45	−0.06	12.2	.4～.6
	41	1.62	1.91	2.42	2.65	2.28	0.37	−0.38	16.2	.4～.5
	42	0.19	0.90	1.58	2.04	1.47	0.57	−0.19	17.4	.4～.6
	43	0.04	0.78	1.25	1.70	1.24	0.46	−0.02	16.2	.4～.5
	44	−0.75	0.32	0.95	1.55	0.94	0.62	−0.02	19.0	.4～.5
Daecheon	45	−0.40	0.58	1.20	1.68	1.13	0.55	−0.13	16.2	.4～.6
	46	−0.22	0.03	0.99	1.42	0.73	0.70	−0.38	12.8	.4～.6
	47	0.40	0.55	0.92	1.48	1.02	0.47	0.20	14.2	.4～.5
	48	0.40	1.27	1.93	2.58	1.90	0.66	0.04	25.6	.4～.6
	49	−0.88	0.40	0.88	1.51	0.96	0.56	0.14	12.6	.4～.6
	50	0.30	0.95	1.45	2.20	1.58	0.63	0.20	17.2	.4～.5
Kimpo	51	−0.55	0.27	0.88	1.56	0.92	0.65	0.05	44.0	.3～.6
	52	0.25	0.64	1.38	2.44	1.89	0.90	0.41	20.4	.4～.6
	53	0.40	1.75	2.70	3.45	2.83	0.85	0.12	21.6	.4～.6
	54	1.21	2.00	2.55	3.13	2.57	0.57	0.03	17.4	.4～.5
Yeoncheon	55	−0.22	0.69	1.26	2.32	1.51	0.82	0.31	19.2	.3～.6

tituents. Most of quartz are monocrystalline.

Polycrystalline content is variable, and generally coarse polycrystalline quartz is more abundant than fine polycrystalline quartz.

Amounts of undulatory and nonundulatory quartz could not characterized the source rock because undulatory quartz resembles each other in different source area in many cases.

Quartz from the study area is very similar each other even polycrystalline quartz and undulatory quartz. From the amounts of mono- and polycrystalline and of undulatory and nonundulatry quartz, some authers i.e., Blatt and Christie(1963), and Blatt(1967b) deduce the source rock of quartz. However I thought that their results could not be applicable to all sandstones. The reason is that the results of Blatt and Chistie(1963) and Blatt(1967b) are derived from grus which is untransported products of rocks. Many of quartz from the study area have well rounded dust ring and show overgrowth of quartz. The dust ring suggests well rounded aeolian sediments.

In Mungyeong area, feldspar content ranges from zero to 6.0 percent of the total constituents. Potash feldspar occupies only 0.2 and 0.6 percent in two sandstone samples.

Sandstones from Mungyeong area show the low content of plagioclase and almost lack of potash feldspar. Sandstones from Kimpo and Yeoncheon areas show slightly higher content of plagioclase and feldspar whose range are zero to 7.0 and zero to 1.0 percent respectively. Sandstones from Daecheon area show the content of plagioclase and potash feldspar ranging from 1.6 to 7.0 and zero to 4.2 percent respectively. Even though it is hard to group the sandstones from study area distinctly, but they could be divided into three different groups according to the amounts of content of plagioclase and potash feldspar.

That is first group is sandstones from Mungyeong area, second is those from Kimpo and Yeoncheon areas, and third is those from Daecheon area.

Generally, Daedong Group in the study area, contains a few or no feldspar. However, a few areas such as northeastern part of Danyang area are thought to have feldspathic sandstone. These areas need a detailed study for the whole character of Daedong Group.

In Mungyeong area, the content of rock fragments ranges from 0.8 to 14.6 percent of total constituents. Chert occupies about one percent of total constituents, and fragments of sandstone, shale, granite and acidic volcanic rocks are few. The content of matrix ranges from 6.4 to 29.6 percent of total constituents.

Generally, sandstone which has high content of quartz has low content of matrix bacause of high maturity. However, sandstones from the study area have high content of quartz and a certain degree of content of martix. It suggests that provenance could be quartzose sandstone and quartzite.

In Kimpo and Yeoncheon areas, content of rock fragement is less than that of Mungyeong area. Sandstones from Kimpo area have the content of matrix ranging from 20.8 to 26.2 percent, which is slightly higher than that of other areas.

Minerai composition of sandstones from four different areas was plotted on ternary diagrams of OFR(quartz-feldspar-rock fragment)(Fig. 6) and QPK (quartz-plogioclase-potash feldspar) (Fig. 7) ternany diagram. Sandstones from Mungyeong area are classified as quartz and quartzose arenite and/or wacke from QFR, and characterized by a samll amount of potash feldspar from QPK.

Sandstones from Kimpo and Yeoncheon areas are classified as the same as that of Mungyeong area. Sandstones from Daecheon area are classified as quartzose arenite/wacke, except two sandstone samples which are classified as lithic arenite/wacke.

Various parameters obtained from grain size analysis are listed in Table 2. C-M pattern of sandstone samples generally reveals fluvial environment(Fig. 8), and there is no distinct difference between the areas. Sandstones from Daecheon, Kimpo and Yeoncheon areas are

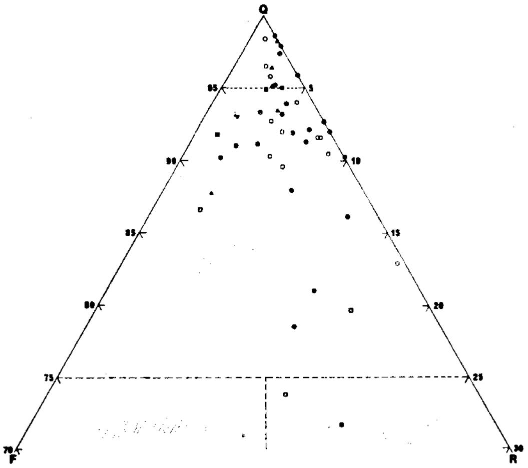

Fig. 6 Ternary diagram showing quartz-feldspar-rock fragment (QFR) of sandstones from study area.

area	arenite	wacke
Mungyeong	○	●
Daecheon	□	■
Kimpo	△	▲
Yeoncheon	▽	▼

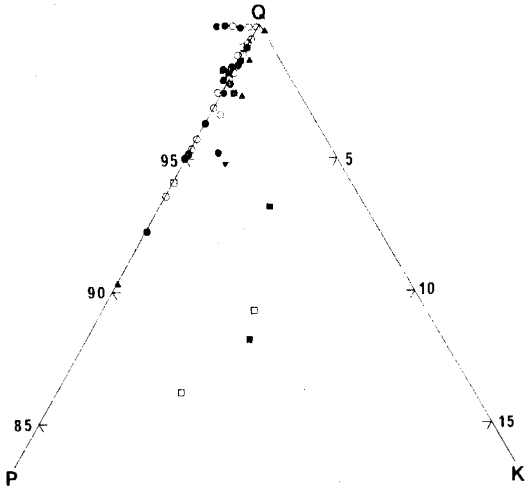

Fig. 7 Ternary diagram showing quartz-plagioclase-potash feldspar(QPK) of sandstones from study area.
Symbols are identical with those of Fig. 6.

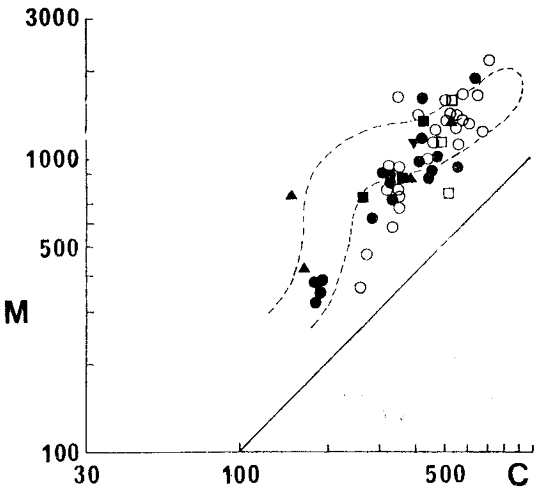

Fig. 8 CM diagram of Mungyeong, Daecheon, Kimpo and Yeoncheon area. Symbols same as in Fig. 6.

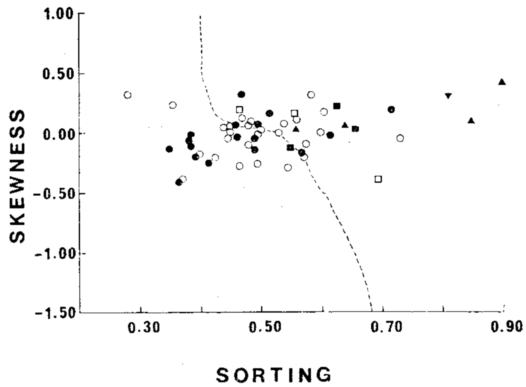

Fig. 9 Skewness versus sorting diagram of Mungyeong, Daecheon, Kimpo and Yeoncheon area. Symbols same as in Fig. 6.

moderately sorted and moderately well sorted with sorting parameter ranging from 0.47 to 0.90, and have skewness ranging from −0.38 to 0.41 but mainly positive skewed and nearly symmetrical skewed. In sorting versus skewness diagram, they are plotted in the region of river sand(Fig. 9). Sandstones from Mungyeong area are plotted equally in the region of river and beach sand.

Log-probability curves are shown in Fig. 10. It is difficult to compare these curves to Visher's curve(Visher, 1969), because the curves have one or more break points in saltation population and no traction population in many cases.

But these are similar to those of Plio-Pleistocene Kobiwako Group which is lacustrine

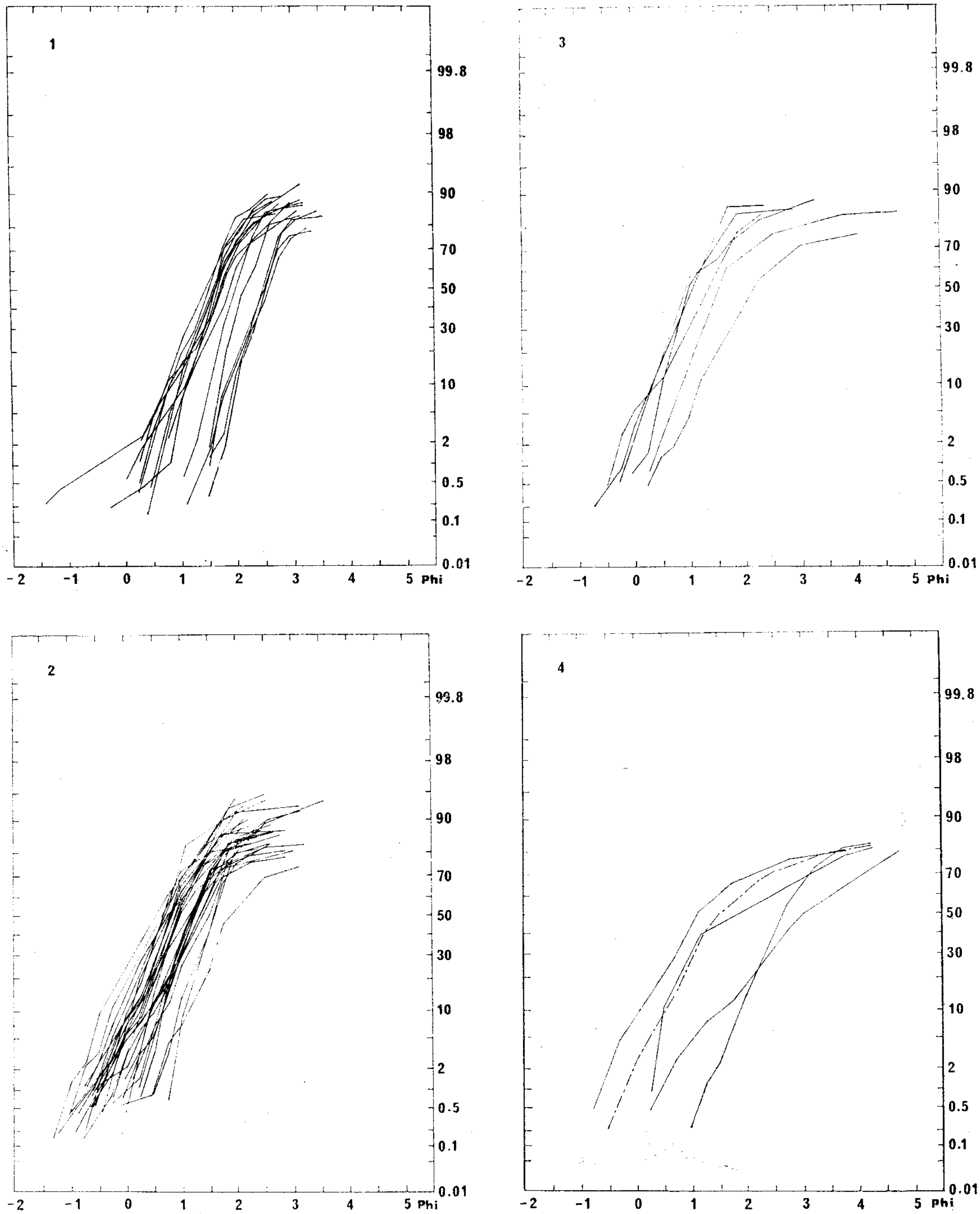

Fig. 10 The pattern of Cummulative size frequency curve of grain size on Log-probability chart.
1. Fine grained sandstones from Mungyeong area.
2. Medium to coarse grained sandstones from Mungyeong area.
3. Sandstones from Daecheon area.
4. Sandstones from Kimpo and Yeoncheon area.
(Dashed line is sandstone from Yeoncheon area.)

environment sediments(Yu, 1983). The log-probability curve indicates lacustrine environment. However, this result is different from that of C-M and sorting-skewness diagram. This fact strongly suggests that the grain size analysis alone for the study of sedimentary environment may not be a complete method.

CONCLUSIONS

1. Sandstones from the study area are characterized by high content of quartz ranging from 59.8 to 87.2 percent of total constituents.
2. Sandstones from Kimpo and Yeoncheon areas have low content of plagioclase and potash feldspar ranging from zero to 7.0 percent, and zero to 1.0 percent, respectively. Content of feldspar from Kimpo aand Yeoncheon areas has slightly higher than that from Mungyeong area. Sandstones from Daecheon area have relatively high content of feldspar than that of Kimpo, Yenocheon and Mungyeong areas.
3. Sandstones from the study area seem to be divided into three different groups, which suggest a certain difference in provenance. First group is sandstones from Mungyeong area, second is those from Kimpo and Yeoncheon areas, and third is those from Daecheon area.
4. Sandstones from Kimpo, Yeoncheon, and Mungyeong areas are classified as quartz and quartzose arenite/wacke while sandstones from Daecheon area are classified as quartzose and lithic arenite/wacke.
5. C-M pattern generally reveals fluvial, sorting versus skewness diagram river sands, and log-probability curve pattern lacustrine environment. Thus, results of grain size analysis alone are not enough to clarify sedimentary environment.
6. Provenance of sandstones from the study area could be quartzose sandstone and quartzite which deposited in aeolian environment.

REFERENCES

Bailey, E.H. and Stevens, R.E. (1960) Selective staining of K-feldspar and plagioclase on rock slabs and thin sections. Amer. Mineral., v. 45, p. 1020-1025.

Blatt, H. (1967a) Provenance Determinations and Recycling of Sediments. Jour. Sed. Petrology, v. 37, p. 1031-1044.

Blatt, H. (1967b) Original Characteristics of Clastic Quartz Grains Jour. Sed. Petrology, 37, 401-424.

Blatt, H. and Christie, J. M. (1963) Undulatory extinction in quartz of igneous and metamorphic rocks and its significance in provenance studies of sedimentary rocks. Jour. Sed. Petrology, v. 33, p. 559-579.

Dickinson, W.R. (1970) Interpreting Detrital Modes of Graywacke and Arkose. Jour. Sed. petrology, v. 40, p. 695-707.

Dickinson, W.R. and Suczek, C.A. (1979) Plate Tectonics and Sandstone Compositions. Amer. Ass. Petrol. Geol., Bull. v. 63, p. 2164-2132.

Friedman, G.M. (1961) Distinction between dune, beach, and river sands. from their textural characteristics. Jour. Sed. Petrology, v. 31, p. 514-529.

Friedman, G.M. (1967) Dynamic processes and statistical parameters compared for size frequency distri bution of beach and river sands. Jour. Sed. Petrology, v. 37, p. 327-354.

Inman, D.L. (1952) Measures for describing the size destribution of sediments. Jour. Sed. Petrology, v. 22, p. 125-145.

Kim, B.C. (1985) Stratigraphy and clastic rocks with special emphasis on sandstones of the Daedong Group in Mungyeong area, Gyeongsangbug-do, Korea. Master thesis, Yonsei Univ., unpublished, 64p.

Norman, M.B. (1974) Improved techniques for selective staining of feldspar and other minerals using Amaranth. Jour. Research U.S. Geol. Survey, v. 2, p. 73-79.

Okada, H. (1971) Classification of sandstone; Analysis and proposal Jour. Geol., v. 79, p. 509-525.

Passega, R. (1957) Texture as characteristic of clastic deposition. Amer. Ass. Petrol. Geol., Bull., v. 41, p. 1952-1984.

Pettijohn, F.J. (1954) Classification of Sandstones. Jour. Geol. v. 62, p. 360-365.

Suh, H.G. et al. (1980) Investigation Report on Chungnam Coalfield(I) Korean Institute of Energy and Resources, 42p.

Thomas, L.P., Park, S.H. and Chun, H.Y. (1976) Geology of the Kimpo and Yeoncheon Coalfield, Gyeonggi Province, Republic of Korea, 80p.

Udden, J.A. (1914) Mechanical Composition of Clastic Sediments, Geol. Soc. Amer., Bull., v. 25, p. 655-744.

Visher, G.S. (1965) Fluvial processes as interpreted from ancient and recent fluvial deposit. In Middleton, G.V. edi., Primary Sedimentary Structure and their hydrodynamic interpretation. 116-132, SEPM, Spec. Pub., v. 12, 265p.

Visher, G.S. (1969) Grain size distribution and depositional processes. Jour. Sed. Petrology, v. 39, p. 1074-1106.

Wentworth, C.K. (1922) A Scale of Grade and Class Terms for clastic sediments. Jour. Geol., v. 30, p. 377-392.

Yu, K.M. (1983) Sedimentological study on the Early Jurassic shallow marine facies in Southwest Japan and the comparison with Daedong Group in South Korea. Memoirs of the Faculty of Science, Kyoto Univ., Series of Geol. and Mineral., v. 59, p. 1-62.

大同層群 砂岩의 鑛物成分과 粒度分析에 關하여

俞 剛 民*

요약 : 초기쥬라기 大同層群의 砂岩을 대상으로 鑛物成分分析과 粒度分析을 堆積物 供給地와 堆積環境을 유추하기 위하여 大同層群의 분포지인 聞慶, 大川, 金浦, 漣川 地域에 대해 실시하였다. 砂岩의 鑛物 및 粒度分析은 聞慶地域을 중점적으로 하여 大川, 金浦, 漣川地域의 일차적 결과를 첨부하였다.

研究地域의 砂岩은 59.8~87.2%의 높은 함량의 石英을 포함하는 특징이 있다. 石英중 많은 수가 風成層에서 생성되어지는 원마도가 좋은 dust ring을 나타낸다. 長石은 극히 드물게 함유되어 있다. 허나 大川地域의 砂岩은 타지역보다 높은수치인 1.8~10.0%를 함유하고 있다. 研究地域의 砂岩의 특성으로부터 大同層群의 供給地는 石英質砂岩 내지 硅岩이었을 가능성이 매우 높다. 砂岩은 quartz 내지 quartzose arenite 및 wacke로 분류되며 단, 大川의 砂岩은 quartzose 내지 lithic arenite 및 wacke로 분류된다. C-M과 sorting-skewness 그림표의 결과는 河川性環境을, 누적곡선의 양상은 湖水性環境을 시사하고 있어 堆積環境에 관한 타증거가 필요하다.

* 延世大學校 理科大學 地質學科