

Discrimination of developmental stage of magmatic arc from chemical composition of sandstone and its implication to the classification of sandstones in tectonic area

NISHIWAKI, Niichi Faculty of Social Research, Nara University, Nara City, 631-8502, Japan.

It is suggested that there is a close relationship between the chemical composition of sedimentary rocks and their tectonic provinces. Many chemical analytical data of sandstones have been accumulated in the study of Japanese Paleozoic-Mesozoic tectonic provinces, and a database was constructed. The revised B.I. (Basicity Index) diagram was proposed to determine the developmental stage of magmatic arc, which is a scatter diagram of the B. I. $(\text{TFeO} + \text{MgO}) / (\text{SiO}_2 + \text{K}_2\text{O} + \text{Na}_2\text{O})$ with $\text{Al}_2\text{O}_3/\text{SiO}_2$. As sandstones of a specific geological unit are plotted in a specific area, a tentative zoning of tectonic provinces in the B. I. diagram has been proposed. The diagram is very powerful, but it is only empirical and should be confirmed not only by geological and sedimentological studies but also with theoretical and statistical analyses. Geochemical data in the database were used for discriminant analysis of developmental stage of magmatic arc which was determined by the sedimentological research, not from chemical composition. Discrimination with the extracted functions was very good, and the detailed examination of the functions clarified that the chemical composition of sandstone is strongly affected by the two factors. One is the chemical composition of rock fragments which reflects the volcanic activity in the arc, and the other is chemical change according to the weathering and maturation process in the source area. It shows that the chemical composition of source area is important for the classification of sandstones in magmatic arc, which generally contain a large amount of volcanic rock fragment.