

Chemical composition of sandstones versus tectonic provinces

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Composition of sedimentary rocks is affected by many factors, including source rocks, transportation process, depositional basin, paleoclimate, tectonic movement, alternation, diagenesis, etc. Many kind of diagrams on mineral composition and various indices were developed and have already been used to analyze these factors. In recent years, many chemical compositional data have been accumulated and used in various studies of sedimentary environment and tectonic provinces.

Bhatia (1983) proposed the Basicity Index (B. I.) diagram to examine the relationship between the chemical composition of sandstones and their tectonic provinces in magmatic arcs. Kiminami *et al.* (1998) has proposed the revised B. I. diagram to adopt for Japanese Paleozoic-Mesozoic sandstones. It is the scatter diagram of $(\text{TFeO} + \text{MgO}) / (\text{SiO}_2 + \text{K}_2\text{O} + \text{Na}_2\text{O})$ 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 division is very powerful but only empirical, and it should be confirmed not only from geological and sedimentological studies but also with theoretical and statistical analyses. The discriminant analysis of developmental stage of magmatic arc has been proved 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 a possibility to revise the traditional classification of sandstone from the chemical composition.