ISOTOPIC DATING AND TRACING OF THE ILLITIZATION PROCESSDURING PROGRESSIVE BURIAL OF VOLCANO-SEDIMENTARY ROCKS

1CLAUER, N., 2SRODON J., 3CHAUDHURI S. and 1LIEWIG, N. 1Centre de Géochimie de la Surface, Strasbourg, France, 2 Polish Academy of Sciences, Krakow, Poland, 3Department of Geology, Kansas State University, Manhattan, Kansas,

Illitization of smectite in volcano-sedimentary rocks progresses with the increase of illite layers in the particles as a function of burial (or of temperature). The K-Ar and d18O isotopic data of progressively illitized smectite in shales suggest a solid-state transformation process with reuse of inherited radiogenic 40Ar. The same data of illite/smectite in sandstones associated with shales favor a dissolution-precipitation process. Illite fundamental particles (0.03 µm) of bentonites yield K-Ar ages that relate to the periods of maximum temperature. Interestingly, in clay assemblages of such rocks the finest fundamental particles are found, in some instances, to yield older K-Ar ages than the thicker particles. This age record is an important revelation for the crystal-growth mechanism of illite. The individual particles of diagenetic fundamental particles therefore consist of illite layers having different ages. Consequently, the K-Ar data of such clay assemblages are an integration of growth histories of continued long and of continued short durations, as under hydrothermal conditions. The d18O values of the illite fundamental particles provide additional differentiated information about the crystal-growth process and its rate. Temperature seems to be the major driving parameter, as timing and duration of the maximum temperature reached during burial-related diagenesis in volcano-sedimentary rocks can be evaluated by dating illite/smectite fundamental particles and tracing their cr