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Influence of fluids on the elastic properties of sedimentary rocks at high pressure and temperature

E. Lebedev

V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, Moscow, Russia (E-Mail: eb-lebedev@yandex.ru / Fax: (007-495) 9382054)

At present the principal information about the structural and material composition of the Earth's interior is derived from seismic measurements. However, the interpretation of the elastic wave velocity data in terms of distribution of the material and structural composition with depth is still difficult especially in the presence of fluids. Water and mineralized fluids in the crust have essential influence on elastic wave velocities in rocks and melts. A description of methods is given in the investigation (Lebedev, Burkhardt et al., 1996). The increase of elastic wave velocity in sandstone at the temperature range 150-400˚C in presence of alkaline fluid was explained by reaction connected with partial dehydration of kaolinite and formation of mica. The increase of elastic P- wave velocity of sandstone at temperatures of 525-640oC in presence of neutral and acid fluids is explained by reaction of silicification (the formation of amorphous silica in intergranular space of rock between crystals of quartz). Silicification is process connected with partial melting, cementation of rock, transformation of rock's microstructure and increase of density. Silicification is connected with a change of the seismic velocities in the Earth's interior. Geophysical investigations revealed the existence of zones in the Earth's middle and upper crust with anomalous seismic velocities. The nature of these zones is still under debate, although there are some indications that they might be correlated with change of microstructure, porosity, permeability and with the presence of fluids. In this study high temperature centrifuge was also used. These studies can contribute to the petrophysical and geochemical interpretation of seismic measurements.