

ABOUT ONE MISTAKE IN THE PHYSICO-CHEMICAL THEORY OF FRACTIONAL FUSION

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It is widely accepted that fractional fusion is not the reverse of fractional crystallization. During fractional crystallization, the composition of the liquid changes continuously, but during fractional fusion successive liquids show compositional gaps corresponding to temperature intervals during which addition of heat causes no melting (Presnall, 1969; Yoder, 1973; Morse, 1980). These compositional breaks is thought to be responsible to the contemporaneous extrusion or intrusion of magmas of strongly different compositions with intermediate members practically absent. This assumed feature of fractional fusion is used to explain an origin of bimodal rock associations (Yoder, 1973).

Physico-chemical analysis of the binary and ternary systems with an eutectic shows that this opinion is in error. The mistake results from an illegitimate assumption about existence of eutectic systems with complete immiscibility between the components. But thermodynamic definition of phase equilibria and two fundamental principles of physico-chemical analysis - principles of continuity and correspondence preclude existence of systems of such type. All eutectic systems should belong to type of systems with limited immiscibility between the components the extent of which can be extremely insignificant but not disappearing at all. As a consequence the composition of melts generated by fractional fusion and fractional crystallization must change progressively producing a continuous spectrum of the melts of intermediate composition.