The state processes, obtaining simplified sites and the coupling on the sea floor, indicates that at most 7–8% of the basal (equivalent to 650 × 106 m3) reacts in mid-oceanic ridge hydrothermal systems. Sufficient iron and manganese are mobilized to have large depletions on the sea floor.

There are no systematic relationships between B and SCF and geologic ages of the crude oils analyzed so far.

**V 2**

**THE MODELING OF KINETICS AND TRANSPORT PROPERTIES**

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The physical chemistry of diagenetic processes in marine sediments must be understood if we are to extend the diagenetic model to incorporate the kinetic and transport phenomena involved. Much work is still needed in this area. We have developed a model to analyze the general problem of multi-component diffusion in marine processes. The main result links the coefficients for cross diffusion of ions i and j, Dij, to the diffusion coefficients of ions i in sea water, Dii, and their concentration C. We compare these for different chemical fluids that can be especially important in estimating the movement of major ions, e.g., Na+ or Ca2+ between oceanic sediments.

The problem of analyzing observed pore water concentration profiles in a kinetic model is already heighten when the steady state assumption is not invoked (Lasaga and Holland, 1976). We have simplified our earlier treatment of non-steady state processes by obtaining quantitatively useful rules for calculating response times of the sediment system to time dependent phenomena. The response times are shown to depend on simple but non-obvious relations among the sedimentation rate, wt% of mineralization coefficients, Dij, and the kinetic rate constant, k, for decomposition of organic matter (e.g., pOH - 15 for certain ranges of values). With these rules, one can attempt to relate the present-day data to the geologic history of the sediments.

Finally a generalization of the current description of biological kinetics is examined.

**V 3**

**HYDROTHERMAL REACTION OF BASALT AND SEA WATER AT MID-OCEANIC RIDGES: A THEORETICAL APPROACH**

T. J. Volcic (Dept. of Geological Sciences, Northwestern Univ., Evanston, Ill. 60201)

The hydrothermal reaction of sea water and mid-oceanic ridge basalts has been numerically modeled under the assumption of partial equilibration for both closed and open systems over the temperature range 150–300°C at 500 bars and at steady state. Computations were performed using a new hybrid program which combines the FACTE approach of Watabe with a modified Newton-Raphson method. The latter permits strict control of accuracy and the physical chemical constraints of temperature and pressure. The theoretical mass transfer, compositional and transport fields for the appropriate conditions of temperature, pressure, and high rock/water ratios. Steady state mass transfer was performed even at low rock/water ratio of 4–20 g basalt kg−1 water for Mg, the PATE approach of Watabe reported laboratory experiments and observations: hydrothermal fields for the appropriate conditions of temperature, pressure, and high rock/water ratios. Steady state mass transfer is computed to occur even at low rock/water ratios of 4–20 g basalt kg−1 water for Mg, the PATE approach of Watabe is used to compute the steady state mass transfer which is shown to occur even at low rock/water ratios.

Estimates of the mass transfer of major elements between the ocean and the basalt crust constrain the rock/water ratio to be 55 to 70, relative to the oil fraction, that is practically no detectable difference in E0 values between liquid and fractions of the crude oil. This indicates that at most 7–8% of the basal (equivalent to 650 × 106 m3) reacts in mid-oceanic ridge hydrothermal systems. Sufficient iron and manganese are mobilized to have large depletions on the sea floor.

The origin of iddingsite is highly controversial but the synthesis of iddingsite from basaltic rocks and sea water has been studied by using a variety of methods. The formation of iddingsite has been investigated in a number of volcanic fields, including those in the Pacific Ocean, the Indian Ocean, and the Atlantic Ocean. The formation of iddingsite is often observed in hydrothermal vents and can be attributed to the interaction between basaltic rocks and seawater.

The negative 35S and 36Cl evidence for the presence of seawater in the basaltic rocks is consistent with the hypothesis that seawater has interacted with basaltic rocks in the vicinity of the hydrothermal vents. The negative 35S and 36Cl evidence is consistent with the hypothesis that seawater has interacted with basaltic rocks in the vicinity of the hydrothermal vents.

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