

Long-term redox reactions with elemental migration and fixation

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Redox fronts are created at the boundary between two rock/groundwater systems with different oxidation environments. The development of redox fronts in the geological environments, e.g. in the near-field and far-fields, of high level radioactive waste repositories of all designs is usually unavoidable.

Redox fronts, and elemental accumulations at them, occur naturally in rock formations where ever a groundwater passes from reducing to oxidising conditions, or vice versa. Some economic ore deposits and uneconomic major or trace element accumulations form in these situations when mineral-rich fluids precipitate dissolved species on encountering a change in the physico-chemical environment, i.e. at a geochemical discontinuity where either temperature, pressure, pH or Eh changes significantly.

As an analogue of long-term redox reactions in the geological has been traced and some significant features related elemental accumulation and migration due to the Fe and Mn oxidation with microbiological activity have been revealed by the recent study. As a preliminary report, the major chemical process of redox front and elemental migration in the geological environment has been discussed.