A thermodynamic model for reaction rim growth in multicomponent systems

R. ABART[1], B. JOACHIM[2], I. SVOBODA[3]
AND F.D. FISCHER[4]

[1]Institute of Geolgocial Sciences, Free University Berlin, Malteserstrasse 74-100, D-12249 Berlin, D (abart@zedat.fu-berlin.de)
2Helmholtz-Zentrum Potsdam, Deutsches Geoforschungszentrum, 14473 Potsdam, D (joachim@gfz-potsdam.de)
3Academy of Science of the Czech Republic, Institute of Physics of Materials, Brno, Zizkova 22, 616 62, CZ (svobj@ipm.cz)
4 Montanuniversität, Leoben, Institut für Mechanik, Franz-Josef-Strasse 18, 8700, A (Mechanik@mu-leoben.at)

If two phases, which have significantly different chemical composition and cannot coexist stably, are brought into contact, new phases may nucleate along their interface. Growth of the reaction zone on the expense of the old phases necessitates chemical mass transfer between the old phases. If chemical diffusion is rate limiting the newly nucleated phases will separate into distinct layers with different modal proportions of the new phases. For systems with only phases of fixed composition the component concentrations, diffusion fluxes and interface velocities at layer boundaries are related through mass jump conditions. The actual values of the interface velocities are obtained from application of the thermodynamic extremal principle [1]. The evolution equations can be integrated in time for known tracer diffusion coefficients of all components in the new phases and known molar Gibbs energies of all phases. If the model is complemented by appropriate experiments, the inverse problem can be solved so that tracer diffusion coefficients can be determined from rim growth experiments. We present applications to multilayer reaction rim growth in the SiO2-MgO-CaO system.

[1] Svoboda, Turek & Fischer (2005) *Philos. Mag*. **85**, 3699 .

The role of elemental chemistry to discriminate diagenesis trend in sedimentary rocks study

R. ABBASI[1]*, M.H. ADABI[2], M.R. MOUSSAVI[2],
H. GHALAVAND[3], M. LOTFPOUR[4]

[1]Department of Geology, Faculty of Earth Sciences, Shahid Beheshti Univ., St. Daneshjoo, Tehran, Iran (*correspondence: r.abbasi@sbu.ac.ir)
[2]Department of Geology, National Iranian South Oil Company (NISOC), Ahwaz, Iran
[3]Keps Company, Tehran, Iran

Carbon and oxygen isotopes are very helpful in getting to know sedimentary environment temperature, digenetic temperature and diagenesis trends in diagenetic environments [1, 2].

This study has used trace elements (Sr, Mn, Na, Mg, Ca, Fe) and isotopic ($\delta^{18}O$ and $\delta^{13}C$) analyses to determine diagenetic trend of Aptian limestones which are called Dariyan Formation located in Fars area that is placed at the south west of Iran.

Binary plots of trace elements and $\delta^{18}O$ and $\delta^{13}C$ values demonstrate that original carbonate mineralogy of Dariyan limestones was aragonite. Elemental and isotopic studies illustrate that these carbonates affected by non marine (burial) diagenesis in a closed to semi-closed system. Furthermore, paleotemperature calculation based on oxygen isotope indicates that very early shallow burial temperature was around 28.5°C.

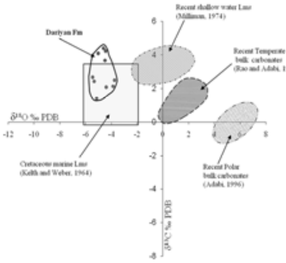

Figure 1: $\delta^{18}O$ and $\delta^{13}C$ cross-plot Samples are placed into Cretaceous marine Lms Field.

[1] Marshal (1992) *Geol. Magzine* **129**, 143-160. [2] Rao (1996) *Arts of Tasmania*, p.206.