

A NEW CONCEPT FOR METAMORPHIC REACTIONS: IRREVERSIBLE DISSOLUTION AND PRECIPITATION IN AN OPEN SYSTEM.

1LEGRAND, J.M.; 2SILVA, W.L.; 2da SILVA, S.G. 1 CCET, UFRN, Natal Brazil; Geoq. UFF, Niteroi Brazil. 2 PG.Geociencias. UNESP, Rio Claro, Brazil

Metamorphic textures and mineral relations are sometimes difficult to explain with the traditional concept of solid state reactions. In the fluid, circulating in the microcracks of the deformed rocks, following the partition coefficient between mineral and fluid, a quantity of ions are dissolved. Evidence of this, despite its very low solubility, quartz is filling veins in numerous deformed rock. The type of reactions which act, solid state or dissolution-precipitation reactions, during a tectonometamorphic event, will depend of the kinetic of the two reaction types. Prograde and retrograde reactions are different. If a fluid is circulating, the system is open and reactions are irreversible. During prograde metamorphism, a shale transforms progressively into chlorite-muscovite schist, following by biotite schist, garnet biotite schist and finely cordierite biotite schist. Then necessarily one of the reagents to form cordierite is necessarily biotite and not chlorite and muscovite. During the retromorphic process, generally the tectonic movements are faster than the kinetics of the reactions and cordierite keeps metastable equilibrium and passes directly to chlorite, muscovite transformation. In the case of Serido micaschist (NE Brazil), with mass balance analyse and a thermodynamic approach we show that cordierite, estrolite and andalusite are formed from dissolution of biotite and plagioclase in an open system, liberating Na^+ and Ca^{++} for the fluid phase. If the flux is high, form andalusite, if the flux is intermediate precipitate, depending on the relative activity of Fe^{++} and Mg^{++} in the fluid solution, either estrolite or cordierite. These equilibrium are discuss in the activity diagrams.