

Effects of heat, fluids and structures on mineral deposition: evidence from geothermal systems

A. G. REYES

GNS-Science 1 Fairway Drive Avalon, Lower Hutt,
New Zealand, a.reyes@gns.cri.nz

In hydrothermal systems, heat acts either as a driving force for fluid convection and rock leaching, as a control for fluid phase changes or separation and/or as a trigger to form a magmatic volatile phase that would carry and concentrate mineral-forming elements to shallower depths. A complexing fluid mediates the release of elements from molten rock or a protolith and the transportation and precipitation of elements e.g., silica, alkali cations, B, Au and Ag as minerals or mineraloids. Apart from focusing fluid flow, crustal structures constrain the hydrological characteristics and fluid pressures of a hydrothermal system and restrict the occurrences of mineral precipitates and halos of rock alteration. In geothermal systems these three interrelated factors and their effects are observable and are often measurable, providing well-defined physical and hydrological parameters that can be related to specific alteration minerals, mineral assemblages and mineral morphologies. Thus knowledge of how mineral alteration forms within a restricted set of measured parameters such as temperature, fluid flow rates, permeability and fluid chemical and isotopic compositions allows the long-term fate of a geothermal well or system to be predicted; and in so doing, enable the evaluation of the past hydrothermal history and extent of an analogous ore deposit.