

Abstract Volume

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Hydrothermal Au mineralisation caused by fluid decompression and cooling in dilatational cavities

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It has been demonstrated that numerous hydrothermal mineralised (Au) quartz veins are related to seismic faulting (Wilkinson and Johnston, 1996; Weatherly and Henley, 2013). Dilatational cavities created during seismic faulting will result in (1) rapid fluid flow from the host rock into the cavities and (2) instantaneous fluid decompression under near-adiabatic and near-isenthalpic conditions (Fig. 1). Adiabatic-isenthalpic decompression of the fluid can either result in fluid heating or cooling (Fig. 1). Calculations demonstrate that for an initial lithostatic fluid pressures of 3-4 kbar and an initial fluid temperature ranging between 400 and 500°C, a CO₂-bearing aqueous fluid has the ability to cool more than 100°C during decompression. The decrease in temperature will reduce the metal solubility largely due to its effect on the sulphur and oxygen fugacity.

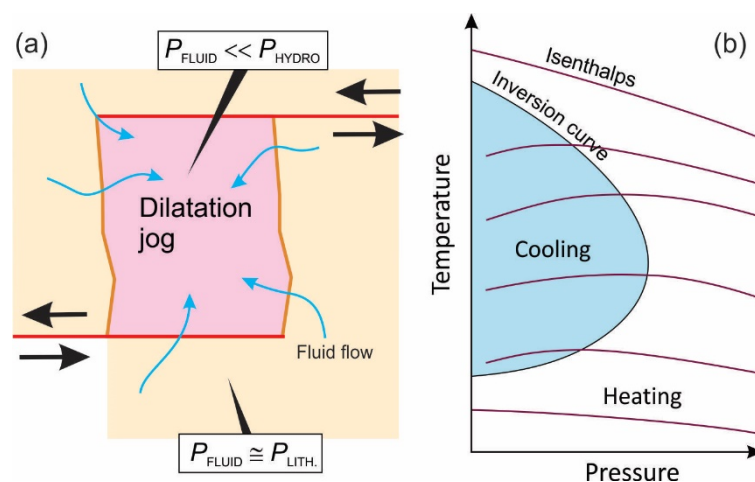


Fig. 1 (a) Cavities caused by, for example, earth quake rupture will result in an instantaneous drop in fluid pressure. Fluids from the immediate surroundings flowing into the cavity will experience a sudden drop in fluid pressure and rapidly expand (modified after Craw, 2013). (b) The adiabatic and isenthalpic fluid decompression (Joule-Thomson effect) will cause either heating or cooling of the fluid depending on (1) the initial near-lithostatic fluid pressure and temperature, (2) fluid composition, and (3) fluid pressure in the cavity.

References

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