1. Introduction

Fluid inclusions have been used for over one hundred years to determine the temperatures associated with various geological processes. While much work has been done to understand the physical properties and activity of the homogenization temperature of fluid inclusions, our understanding of how precisely the temperature of a ‘geological event’ can be constrained using fluid inclusions is still not well established. In this study we undertook a detailed analysis of a range of clastic samples from a wide range of geologic environments, including sedimentary basins, metamorphic rocks and volcanic systems.

2. Fluid Inclusion Analyses

Fluid inclusions are time capsules that offer information on the P-T-X properties and origin of the fluids associated with mineral precipitation and alteration after the entrapment of the inclusions. These data can be incorrectly interpreted if basic assumptions, referred to as Roedder’s rules, are applied to the inclusions. The rules state that:
1. Primary inclusions have trapped a unique mixture.
2. Nothing is added to or lost from the inclusion.
3. The inclusion ‘is identified as a primary inclusion if the fluid does not separate from the host mineral when heated at a series of temperatures to boiling point.

3. Effect of inclusion size on T

Assuming that all fluid inclusions are in an FIA were trapped at nearly the same temperature and pressure, but that there has been no gas phase nucleation and equilibration, it would be expected that the same homogenization temperature (T), however, fluid inclusions with smaller size T, on the order of 350°C to 6°C. This lowers the homogenization temperature of smaller fluid inclusions. Thus, during heating, small, secondary inclusions will reach the homogenization size at a lower temperature, and thus homogenize at a lower temperature, compared to large inclusions.

4. Reliability/limitation T, orientation, and geologic environment

The precision with which the homogenization temperature of fluid inclusion assemblage can be determined varies depending on the geologic environment in which they are found. The homogenization temperature of fluid inclusions trapped in fluorite is a useful tool because of the mineral’s ability to retain multiple generations of fluid inclusions, and the ease of sample preparation. For example, the homogenization temperature of fluid inclusions trapped in fluorite, physical properties of the host mineral, as well as sample collection and preparation, and thermal gradients during T, influence the reliability of the results.

5. Fluid Inclusions in Magmas (Vitrophyre, magmatic leucogranite, porphyry ore deposit)

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6. Preliminary results on primary inclusions in porphyry ore deposits

Preliminary results on primary inclusions in porphyry ore deposits suggest that the homogenization temperature of primary fluid inclusions in porphyry ore deposits is a useful tool for estimating the temperature of the magmatic system. The homogenization temperature of primary fluid inclusions in porphyry ore deposits is a useful tool for estimating the temperature of the magmatic system. The homogenization temperature of primary fluid inclusions in porphyry ore deposits is a useful tool for estimating the temperature of the magmatic system.

7. Conclusion

Applying the fluid inclusion homogenization temperature to fluid inclusion studies provides the most detailed and accurate analysis of P-T-X history and the most rigorous interpretation of the data. The homogenization temperature of fluid inclusions trapped in fluorite provides a useful tool for estimating the temperature of the magmatic system. The homogenization temperature of fluid inclusions trapped in fluorite provides a useful tool for estimating the temperature of the magmatic system. The homogenization temperature of fluid inclusions trapped in fluorite provides a useful tool for estimating the temperature of the magmatic system.