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Sapphirine-bearing assemblages as indicators of metamorphic conditions

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Sapphirine-bearing assemblages occur in rocks that have undergone different tectono-metamorphic histories, with the $P-T$ range of formation being estimated from below 700˚C and 0.5 GPa to above 1100˚C and 1.5 GPa. Sapphirine associated with quartz is attributed exclusively to the highest temperature conditions of crustal metamorphism. Although experimental data involving sapphirine extend over an even wider $P-T$ range, the quantitative interpretation of sapphirine-bearing assemblages remains ambiguous, and thermodynamic properties of sapphirine are still poorly understood. Internally consistent thermodynamic data sets (Gerya et al., 2004; Kelsey et al., 2004) also imply significantly different phase relationships for sapphirine-bearing assemblages even in a simple system MgO-Al_2O_3-SiO_2. Discrepancies in the calculated $P-T$ stabilities of key mineral assemblages severely limit our ability to characterize quantitatively the conditions of many high-temperature metamorphic terrains. As demonstrate examples from ultrahigh-temperature granulite complexes, the choice of thermodynamic data set may also significantly affect the geodynamic modelling.

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References

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