

## **Algorithmic modifications extending MELTS to calculate subsolidus phase relations**

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### **ABSTRACT**

Algorithmic modifications to the MELTS software package are presented in order that calculations of heterogeneous phase equilibria can be performed in the subsolidus. Methods are presented for: (1) selecting an “initial guess assemblage” that satisfies the bulk composition constraints; (2) detecting saturation of new phases (including liquid) in an assemblage; (3) adding and removing phases from the assemblage without adjusting the system bulk composition; and (4) constraining the assemblage to a fixed  $f_{O_2}$ . These methods have been added to MELTS, allowing it to calculate heterogeneous phase equilibria with or without liquid, closed or open to O, and with fixed intensive variables ( $P,T$ ), ( $P,S$ ), ( $P,H$ ), or ( $V,T$ ). Applications include fractional melting calculations, metamorphic phase equilibria, and geophysical models of subsolidus regions of the Earth.