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A revised diamond-graphite transition curve

HOWARD W. DAY*

Department of Geology, University of California Davis, One Shields Avenue, Davis, California 95616, U.S.A.

ABSTRACT

The transition from diamond to graphite is a key equilibrium for interpreting ultrahigh-pressure metamorphic rocks. Despite widespread interest, there remain significant systematic differences between the best available experimental determinations of *P* and *T* (Kennedy and Kennedy 1976) and numerous thermodynamic calculations of the transition. At temperatures below 1400 K, calculated equilibrium pressures are lower than extrapolations of the experiments by as much as 5 kbar. At 3000 K, calculated pressures vary from more than 8 kbar above to almost 20 kbar below the position of the extrapolated transition. A revised curve based on a critical review of the experimental and thermodynamic data is consistent with expanded experimental brackets and the preferred calorimetric data. It is steeper than the transition proposed by Kennedy and Kennedy (1976) and previous calculations and passes through 16.2 kbar, 298 K; 33.9 kbar, 1000 K; 63.5 kbar, 2000 K; and 98.4 kbar, 3000 K.

The revised curve implies that the minimum pressure for formation of diamond-bearing crustal rocks is 3–4 kbar less than implied by extrapolation of the experiments. Because the revised transition is steeper than most previous calculations, the triple point among graphite, diamond, and liquid carbon may be as much as 40 kbar higher than previously estimated.

Keywords: Diamond, graphite, transition, equilibrium