Example Using the Clausius-Clapeyron Equation
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Consider the reaction between grossular, corundum, anorthite and gehlenite:

Gr + Co = An + Ge

Boettcher (1970) determined that this reaction takes place between 760 and 780 C at 1 Kbar pressure.

Use Boettcher's results as a starting point and apply the Clausius-Clapeyron Equation to determine the temperature of reaction at 10 Kbar.

To do this:

This is a solid-solid reaction, so it is reasonable to assume that ΔS/ΔV of reaction is about constant. So we can calculate the slope of the reaction at 1bar and use that to extrapolate.

From thermodynamic reference books, we find the following 1-bar molar entropy and volume values for the four phases involved:

	SV J/deg	Cm^3
Gr	255.5	125.3
Co	50.92	25.575
An	199.3	100.79
Ge	209.8	90.24

From these values we can calculate the ΔV and ΔS of reaction:

$\Delta V = V_{An} + V_{Ge} - V_{Gr} - V_{Co} = 100.79 + 90.24 - 125.3 - 25.575 = 40.155\ Cm^3/mol$
$\Delta S = S_{An} + S_{Ge} - S_{Gr} - S_{Co} = 199.3 + 209.8 - 255.5 - 50.92 = 102.68\ J/deg \bullet mol$

We need a conversion factor to help with the units:
$10\ Cm^3 = 1\ J/bar$

So, ΔV = 4.0155 J/mol

The Clausius-Clapeyron equations says that:
dP/dT = ΔS/ ΔV = 102.68/4.0155 = 25.57 bar/deg

Using this value, we find that if the reaction takes place at 770 °C at 1 Kbar, it must take place at 1121 °C at 10 Kbar.

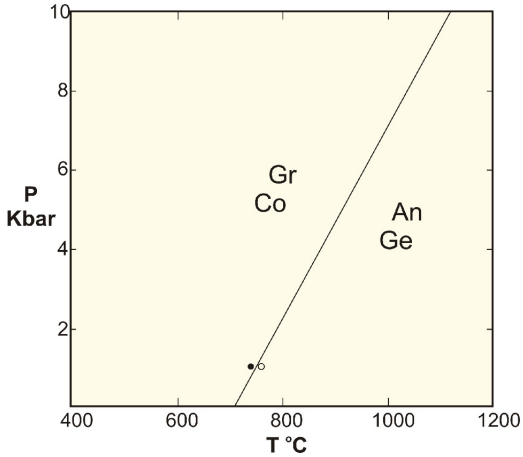

Figure 1. The reaction Gr+Co=An+Ge extracted from Boettcher's (1970) experimental results (solid and open circles) to 10 Kbar.