The slope of the isotherm in the Ps-diagram in measurable quantities equals $\frac{1}{-v\beta}$. Now, assume an ideal gas. The slope can be rewritten to:

For an ideal gas $\beta = \frac{1}{T}$.
So $\frac{1}{-v\beta} = \frac{T}{-v} = -\frac{P}{R}$.