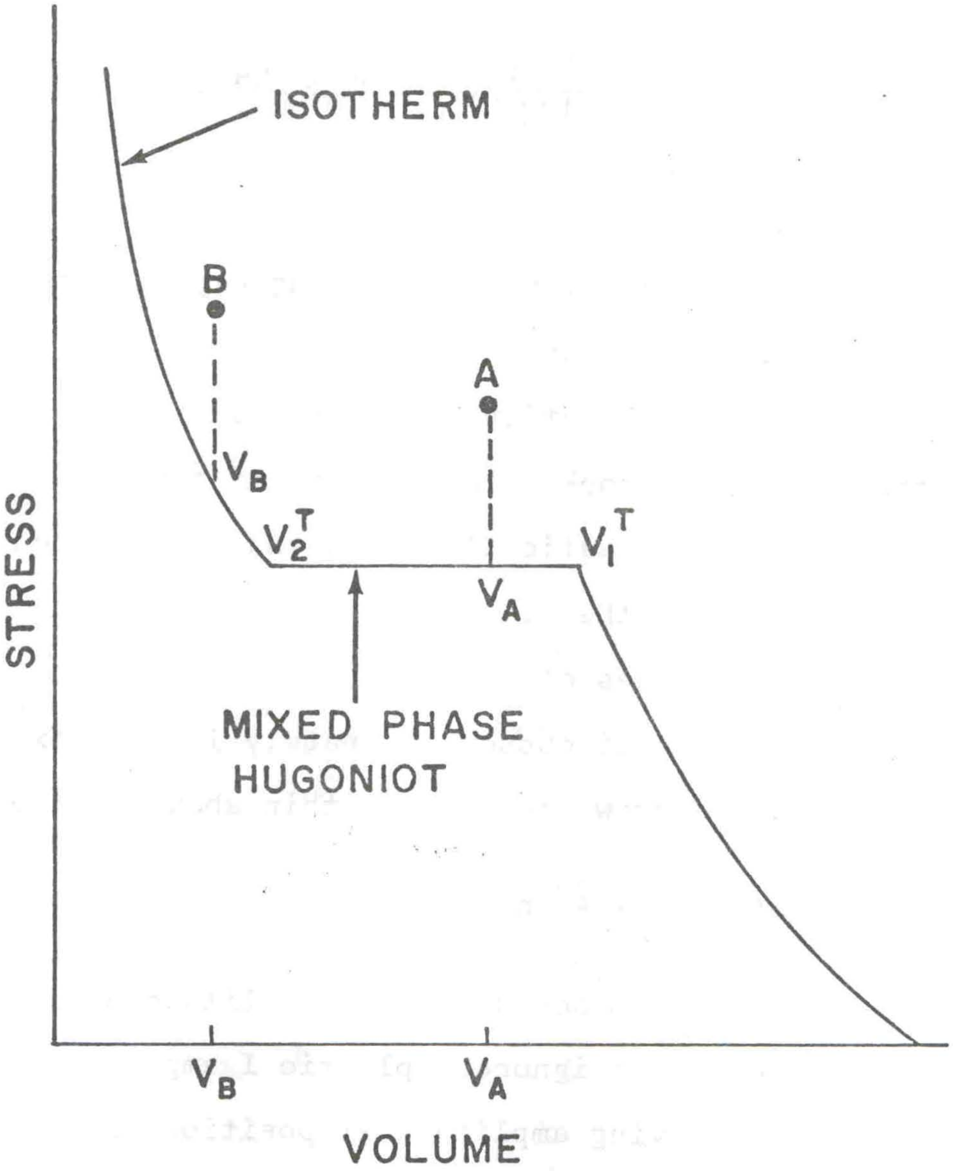

Fig. 6.1.--Isotherm used to define $f^{eq} = (V_A - V_1^T)/(V_1^T - V_2^T)$ for state A where $0 \le f^{eq} \le 1$ and $f^{eq} = 1$ for state B where $V_B \le V_2^T$.

considered state. Under conditions of constant V and E, increments in f are proportional to increments in G_{21} and it follows that[27,29]

$$f - f^{eq} = \frac{JG_{21}}{|A|} , \quad 0 \le f^{eq} \le 1 . \qquad (6.7)$$

6.1. Relaxation Times

There are three types of existing experimental data which measure different aspects of shock evolution in iron and allow evaluation of relaxation time: (1) amplitude of stress behind the plastic I shock as a function of sample thickness, (2) rise time of the plastic II shock, and (3) residual metallurgical effects when the plastic II shock is rapidly diminished by relief waves. Values of and bounds for τ for these different types of data are discussed separately in the next three subsections and are shown to agree within about 50 percent.

6.1.1. Decay of Stress Associated with the Plastic I Shock

The plastic I shock decays in amplitude as it propagates. If material strength is ignored, plastic I amplitude is expected to be near final driving amplitude at positions near the impact boundary. By making the essential assumption that phase 1 material is shocked to final driving stress, P^D, at the impact surface and that the plastic I shock velocity is constant, Eqs. (6.1) and (6.4) can be used to derive an approximate differential equation for rate of decay of the plastic I shock amplitude: