density, $\tilde{\rho}_\alpha$. No relation such as Equation (37) can be obtained for the constituent compression in the physical configuration, $\tilde{\rho}_\alpha^-/\tilde{\rho}_{\alpha_0}$. When $\underset{\sigma}{\hat{c}}_\alpha$ is not zero, Equation (37) must be replaced by

$$\eta_\alpha = \eta\left(1 + \frac{\underset{\sigma}{\hat{c}}_\alpha}{\rho_{\alpha_0} U}\right) \tag{38}$$

We can now investigate the question of a phase transformation in one of the constituents. Suppose constituent S_1 transforms into constituent S_2 at shock pressures in excess of $\tilde{P}^*$. We assume that no S_2 is initially present leading the shock. That is

$$\rho_{2_0} = 0 \tag{39}$$

We assume that, following the shock, all of constituent S_1 has been transformed to S_2 so that

$$\rho_1^- = 0 \tag{40}$$

Using Equation (40) in Equation (25), we obtain

$$\underset{\sigma}{\hat{c}}_1 = -\rho_{1_0} U, \qquad \text{for} \quad \widetilde{P}_\alpha^- \geq \widetilde{P}^* \tag{41}$$

while use of Equation (39) in Equation (25) gives

$$\underset{\sigma}{\hat{c}}_2 = \rho_2^-(U - v^-), \qquad \text{for} \quad \widetilde{P}_\alpha^- \geq \widetilde{P}^* \tag{42}$$

Then, if no other mass exchange occurs, Equation (13) implies that

$$\rho_2^-(U - v^-) = \rho_{1_0} U \tag{43}$$

whenever $\widetilde{P}_\alpha^-$ exceeds the transformation pressure, $\widetilde{P}^*$. In this case, we have

$$\frac{\rho_2^-}{\rho_{1_0}} = \eta_3 = \eta_4 = \cdots = \eta_k = \eta \tag{44}$$

More complex interactions, including chemical reactions among constituents within the shock surface, can be treated in a similar manner. It is necessary only to assume constitutive relations for the supplies, $\underset{\sigma}{\hat{c}}_\alpha$, obeying Equation (13).

Next, we turn to the physical configuration and assume that the constituent crystal pressures, $\widetilde{P}_\alpha^-$, are all equal, provided S_α exists behind the shock. That is

$$\widetilde{P}_\alpha^- = \widetilde{P}^-, \qquad \text{for all } \alpha \text{ such that } \rho_\alpha^- \neq 0 \tag{45}$$

Then Equations (23) and (30), together with this assumption, imply that

$$P^- = \widetilde{P}^- \tag{46}$$

That is, the total mixture pressure must equal the crystal pressure in each constituent. The momentum jump equation [Equation (26)] can then be written as

$$n_\alpha^- \widetilde{P}^- + \underset{\sigma}{m_\alpha} = \rho_\alpha^-(U - v^-)\, v^- \tag{47}$$

Summing this equation over α and using Equations (14) and (16), we obtain the usual momentum jump equation for the whole mixture.

$$\widetilde{P}^- = \rho^-(U - v^-)\, v^- \tag{48}$$

Our assumptions of equal particle velocities and equal crystal pressures in all extant constituents have implied the form of the momentum supply functions, $\underset{\sigma}{\hat{m}_\alpha}$. Eliminating the quantity $(U - v^-)\, v^-$ between Equations (47) and (48) yields

$$\underset{\sigma}{\hat{m}_\alpha} = \widetilde{P}^-(c_\alpha^- - n_\alpha^-) \tag{49}$$

where c_α^- is the concentration ρ_α^- / ρ^- following the shock. Using Equation (38), we can write c_α^- as

$$c_\alpha^- = c_{\alpha_0}\left(1 + \frac{\underset{\sigma}{\hat{c}_\alpha}}{\rho_{\alpha_0} U}\right) \tag{50}$$

Note that, if no mass transfer occurs, the concentration will not change crossing the shock.

The energy balance relation, Equation (27), may also be simplified by these assumptions. If S_α does not vanish behind the shock, we can divide Equation (27) by the volume fraction, n_α^-, to obtain

$$\widetilde{P}^- v^- + \frac{\underset{\sigma}{\hat{\epsilon}_\alpha}}{n_\alpha^-} = \tilde{\rho}_\alpha^-(U - v^-)\left(e_\alpha^- + \frac{1}{2}(v^-)^2\right) + \tilde{h}_\alpha^- \tag{51}$$

where Equations (17), (19), (23), (28), and (45) have all been used. Also, summing Equation (27) over α and taking Equations (15), (30), (31), and (32) into account, we obtain the usual energy jump equation for the whole mixture.

$$\widetilde{P}^- v^- = \rho^-(U - v^-)\left(\epsilon^- + \frac{1}{2}(v^-)^2\right) + h^- \tag{52}$$

We point out here that the constituent heat flux, h_α^-, does not account in any way for transfer of heat between constituents. The action of h_α^- is entirely restricted to S_α. Heat may be transferred among the constituents, however,