Figure 1 shows a plot of $\log \dot{r}_{av}$ vs $\log G_o$. The data points for $p_c = 1$ atm fall on a straight line and show that, for a constant pressure of one atm, the regression rate law is of the form

$$\dot{r}_{av} = aG_o^{\,n} \quad (1)$$

$n = 0.55$ from the slope of the straight line.

It is also seen from Fig. 1 that for identical oxidizer mass flux, $\dot{r}_{av}$ is much greater for the higher pressure than for 1 atm. This indicates that pressure dependence of regression rate is considerable. Equation (1) and then be modified to a more general form

$$\dot{r}_{av} = bG_o^{\,n} p_c^{\,m} \quad (2)$$

The value of m was computed by comparing $\dot{r}_{av}$ at higher pressure with that at 1 atm. For runs 6, 7, 8, and 9, the values of m were found to be 0.65, 0.601, 0.62, and 0.603, respectively (average $m = 0.61$). These values are quite close and therefore Eq. (2) is a very valid description of the regression rate behavior in the present case.

The dependence of regression rate on oxidizer mass flux can be explained on the basis of convective heat transfer to the fuel surface from the diffusion flame zone, as in the case of a solid-gas hybrid. The effect is modified, however, by the presence of premixed flame near the surface and by the kinetics of the solid liquid-chemical reactions on the surface. Both these processes are modified by changes in pressure. As the pressure is increased, the premixed flame moves closer to the surface thus increasing heat transfer to it. Simultaneously, the rate of the solid-liquid surface reaction is also enhanced. The two effects combine to give the observed increase in regression rate with p_c. It is significant to note that increase in regression rate is considerable for comparatively small increases of p_c. It appears, therefore, that for the ranges of pressures and mass flows investigated, the chemical kinetic effects are very important. Since the solid-liquid reactions and the premixed flame are likely to be present in solid-liquid hybrid combustion under all conditions, it can be expected that the regression rate will show pressure dependence at higher oxidizer flow rates and combustion pressures. It cannot be said, however, that the quantitative relationship will be of the same form as that in Eq. (2). In the absence of a suitable theory combining the diffusion flame and premixed flame effects, this can be clarified only by further studies of regression rates at higher pressures and oxidizer mass flow rates.

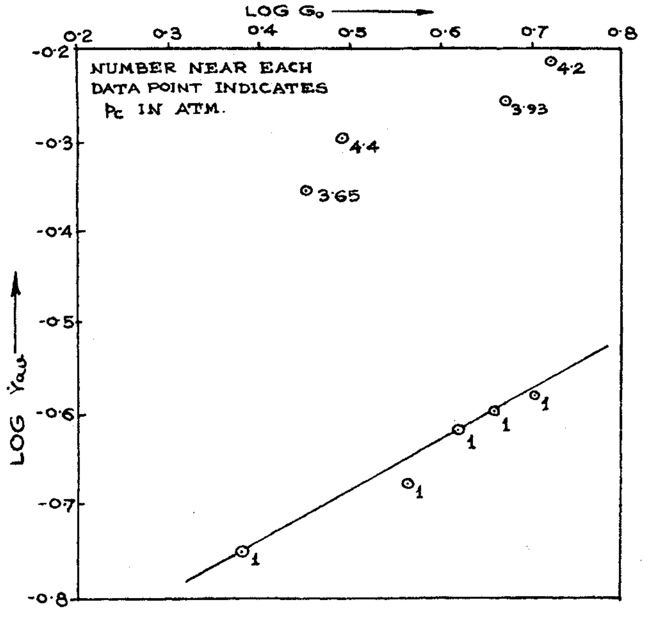

Fig. 1 Variation of regression rate with oxidizer mass flux and combustion chamber pressure.

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Errata

Transition Effects on Slender Vehicle Stability and Trim Characteristics

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ON p. 8 in Fig. 11, the coordinates should be "$C_{m\alpha}$ and $C_{mq}+C_{m\dot{\alpha}}$, arbitrary scales," instead of "$C_{m\alpha}/(C_{m\alpha})d_N = 0$ and $(C_{mq}+C_{m\dot{\alpha}})/(C_{mq}+C_{m\dot{\alpha}})d_N = 0$."

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