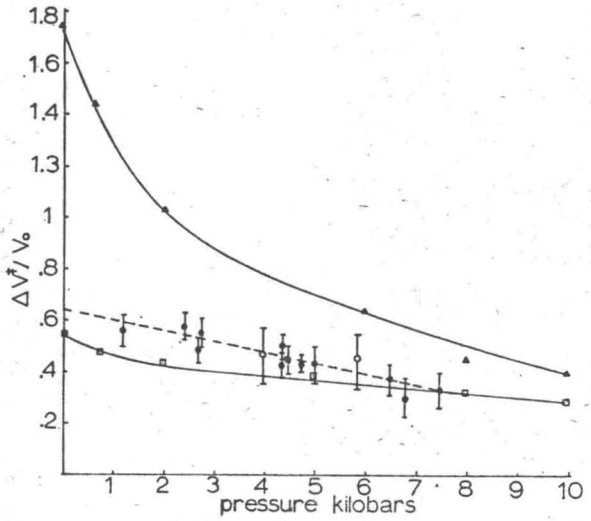

FIG. 1. Activation volume ratio for Zn. Results of the present creep study are given by open circles for 57°C, and dark circles for 27°C. Results of Liu and Drickamer are given by triangles for self-diffusion along c axis, and squares in the basal plane.

rate was then used, along with the geometric mean of the rates of the interval preceding and following it, in the determination of the ratio,

$$\Delta V^{\ddagger}/V_0=[kT/V_0(P_2-P_1)]\ln(\epsilon_1/\epsilon_2), \qquad (1)$$

where V_0 is the room-temperature room-pressure atomic volume, k is Boltzmann's constant, T the absolute temperature, and $\dot{\epsilon}_1$ the deformation rate at pressure P_1.

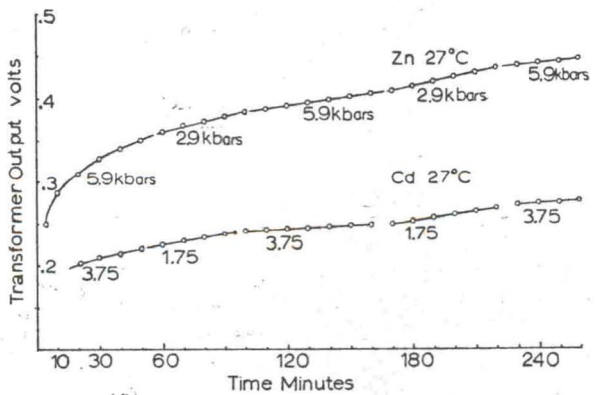

FIG. 2. Typical segments of creep curves for Zn and Cd for which pressure has been varied at periodic intervals.

The activation volume to atomic volume ratio shown in Fig. 1 is a function of the average of the pressures used in Eq. (1). The error bars of Fig. 1 are the extremes in the volume ratio at a given pressure on a given sample. The dashed straight line was determined by least squares fitting. The present data are not inconsistent with a curvilinear dependence of $\Delta V^{\ddagger}/V_0$ upon P, but such a construction would be somewhat arbitrary.

Liu and Drickamer[6] report the coefficient of self-diffusion parallel to the c axis is greater than that for self-diffusion perpendicular to the c axis. They found the self-diffusion rate in polycrystals to be intermediate between those of single crystals in directions parallel and perpendicular to the c axis. The activation volume ratio for creep lies slightly above that for diffusion in the basal plane. The present creep studies were carried out at 27° and 57°C, the diffusion studies were carried out at 307°C. If the activation volume ratio is not strongly temperature-dependent, these studies lend support to a mechanism in which creep is controlled by self-diffusion in the basal plane.

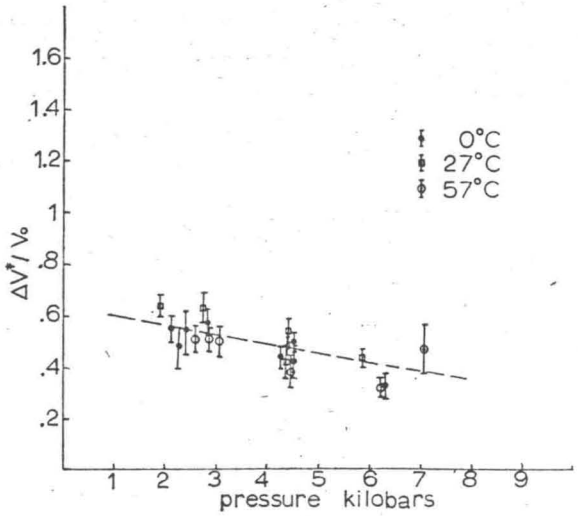

FIG. 3. Activation volume ratio for creep in Cd.

Figure 3 shows the activation volume ratio $\Delta V^{\ddagger}/V_0$ versus pressure for creep in Cd. There are no diffusion data for comparison, but the effect appears to be similar to that in Zn, that is $\Delta V^{\ddagger}/V_0$ is about the same for both metals at a given pressure.