Broadly speaking, we find that ascent and heating occur ahead of depressions, and subsidence and cooling in their rear. Calculations based on Australian data have given vertical velocities of the order of several dynes cm^{-2} sec^{-1} and heating or cooling at the rate of 10^3 ergs gm^{-1} sec^{-1}. It seems of particular interest that this distribution of heating and cooling is consistent with the release of heat of condensation ahead of a depression and with the increased radiational heat loss in the region of subsidence and clearing in its rear. The diabatic heating and cooling implied by the equivalent-barotropic model therefore make physical sense, and this may not be without relevance for the relatively good performance of the barotropic model in numerical weather prediction. A programme of Australian case investigations is now under way in which the realism of the equivalent-barotropic fields of vertical velocity and diabatic heating and cooling is being checked.

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RADIOCHEMISTRY

Radiolysis of Solid *Cyclo*hexane–Benzene Mixtures at −196° C

Kroh and Karolczak[1] recently reported hydrogen yields in the γ-radiolysis of solid benzene–*cyclo*hexane mixtures at −196° C which differed markedly from those observed in the liquid phase. The solid mixtures were prepared by plunging liquid samples into liquid nitrogen. Our results for such samples are shown by the open circles in Fig. 1, and are in qualitative agreement with those reported by Kroh and Karolczak. The samples were irradiated with cobalt-60 γ-rays at a dose rate of 2×10^{22} eV/l./h to doses of between 2 and 4×10^{22} eV/l.

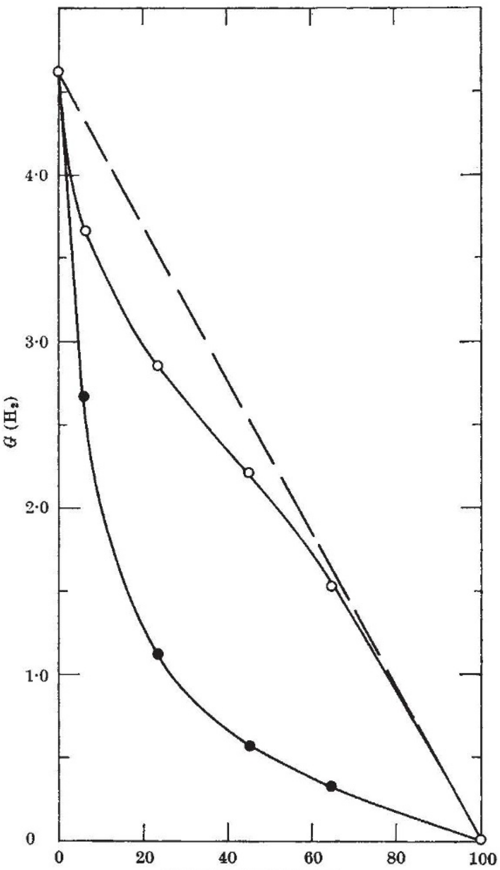

Fig. 1. Hydrogen yields in the radiolysis of solid mixtures of *cyclo*hexane and benzene showing the effect of method of preparation. ○, Samples frozen from liquid; ●, samples condensed from vapour

We suspected that, during freezing, there had been some segregation of the liquid mixture into two phases, solid benzene and solid *cyclo*hexane. This segregation would eliminate the interactions which occur in the radiolysis of the liquid mixtures and the yields would lie close to the mixture line. To test this we prepared other samples by the slow condensation of a stream of the pre-mixed vapours on to a surface cooled by liquid nitrogen. As segregation into two phases will be inhibited at these temperatures these samples should be homogeneous. The hydrogen yields obtained in the radiolysis of these samples are shown by the solid circles. These yields are much lower than from the frozen liquid samples and do not differ qualitatively from those found in the liquid[2].

These results are part of more detailed investigations we are making on the radiolysis of solid hydrocarbon mixtures. We find that the interactions in liquid alkane mixtures[3] also occur in the solid. The effects of additives, for example, benzene, on these interactions are also similar to those observed in the liquid[4]. Homogeneous mixtures can rarely, if ever, be prepared by freezing the liquid, and when segregation occurs the yields obey the mixture law.

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IN connexion with our note[1] in *Nature* and the preceding communication by Dyne and Denhartog it seems worth while to stress several points significant for the radiolysis of solid organic mixtures.

Curves of the type reported previously[1] have been obtained recently by us in some other cases. The plots of $G(CH_4)$ and $G(H_2)$ versus $[C_6H_6]$ in $C_2H_5OH + C_6H_6$ system[2] show plateau particularly pronounced for $G(H_2)$ in the range of electron fraction of benzene $\varepsilon_b = 0{\cdot}2$–$0{\cdot}4$.

The dependence of $G(H_2)$ on (C_6H_6) in *cyclo*hexane–benzene mixture at −80° C (ref. 3) is similar to that obtained at −196° C (ref. 1). All these curves have been obtained with good reproducibility for fast frozen samples.

In contrast to the curve of Dyne and Denhartog reported for samples frozen from liquid $C_6H_{12} + C_6H_6$ mixtures, all the afore-mentioned curves with markedly appearing plateau cannot be explained by simple segregation. Segregation, which certainly occurs, plays probably an important but not exclusive part in shaping the curves. According to the recent data of Spangler and Sponer[4] in solid *cyclo*hexane–benzene system at −196° C, for compositions corresponding to the plateau, a fair amount still exists of cubic *cyclo*hexane crystals with substituted benzene (for fast-frozen samples) and monoclinic *cyclo*hexane with substituted benzene (for slow-frozen samples).

Perhaps even more interesting results, illustrated in Fig. 1, are those recently obtained by us for the frozen system *cyclo*hexane–biphenyl in the concentration range for which segregation seems to be less probable. The shape of the curve (○) for liquid system may suggest that the protective action of biphenyl is feasible by two different mechanisms and that only one of them is operative in the solid phase (●).

All the facts reported by Dyne and Denhartog and us seem to indicate that further investigations on the radio-