value previously reported in the literature[7]. Other deformation work is now in progress to check this point.

A recent investigation of the recovery of lead at low temperatures was made by Boesono[8] who followed the decrease of the extra resistivity at various temperatures after rolling at 90° K. The results indicate recrystallization at −100° C. after very short times with lead of 99·99 per cent purity and at −30° C. for a 'commercial' lead. Such results seem entirely possible with the large deformation available from rolling.

In comparison with the results for zone-refined aluminium it seems probable that under comparable conditions the zone-refined lead will recrystallize at lower temperatures. A comparison of the two purities of lead indicates that a change from 99·999 to 99·9999 per cent causes a decrease in the recrystallization temperature in the same test of about 30° C. These are remarkable effects to be attributed to such small impurity contents, and yet they will most likely be general for any face-centred cubic metal.

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CHEMISTRY

Droplet Circulation and Interfacial Disturbances in Gas-Liquid Systems

During recent years the process of liquid-liquid extraction has become progressively more important and the mechanism of solute transfer between liquid droplets and a second substantially immiscible liquid environment has received considerable attention. In the course of their work in this field, Lewis and Pratt[1] observed that when solute transfer, for example, acetone, occurred between hydrocarbon droplets and water, then in many cases, the droplets exhibited rapid and violent oscillations which they termed 'kicking'. Systems which exhibited this effect were found to have higher mass transfer rates than those predicted from theoretical considerations[2]. More recently the phenomenon of droplet oscillation in liquid-liquid systems has been the subject of extensive study, notably by Haydon[3] and Davies and Haydon[4]. These workers concluded that droplet oscillation was the result of the interfacial solute concentration becoming non-uniform, thereby giving rise to local interfacial tension variations which resulted in temporary droplet instability.

Similar effects have now been observed in the case of a pendant liquid droplet evaporating in air. The droplet, containing aluminium or plumbago particles, was suspended from the tip of a narrow bore tube and an optical system was used to project an enlarged image of the droplet on to a screen so that circulation patterns could be observed visually. Under these conditions, droplets of toluene, chloroform and acetone evaporating in air all exhibited vigorous internal circulation. Provided that the droplets were small, there was little evidence of the 'kicking' phenomena reported previously in the case of liquid-liquid systems although the interior of the droplet was in constant agitation. However, as the droplet size was increased, internal agitation was eventually accompanied by droplet oscillation or kicking as the breakaway point was approached.

Pendant water droplets in air showed only slight internal circulation, but the presence of a second, more volatile, component such as acetone or ammonia produced marked circulation, the degree of internal agitation increasing with the concentration of the added component. The presence of acetone in either toluene or chloroform droplets was also found to produce a similar result.

Plane gas-liquid interfaces have also been examined and again internal circulation and interfacial disturbances were noted. Thus suspended aluminium particles showed varying degrees of circulation during the free evaporation of acetone, methylated ether, benzene, toluene and ethyl acetate contained in a shallow Petri dish. Water appeared to be quiescent but, as before, the presence of acetone set up circulation patterns in the bulk liquid and, as in the case of pendant droplets, the circulation of methylated ether, benzene, toluene and ethyl acetate was also enhanced by the presence of acetone. On the other hand, if acetone or methylated ether vapour was brought near the surface of pure water, violent circulation occurred accompanied by continuous rippling of the vapour-liquid interface.

It is noteworthy that both internal circulation and interfacial rippling could be completely inhibited by traces of detergents such as 'Teepol' or by the addition of a surface film of cetyl alcohol. As might be expected, circulation also ceased when the gas-liquid system was totally enclosed so that concentration gradients in the plane of the interface were minimized and equilibrium conditions were approached.

There is no reason to suppose that these observations are specific to the systems examined and it may well be that, in many cases, mass transfer across gas-liquid interfaces is accompanied by internal liquid circulation and in extreme cases by interfacial rippling. Such considerations are of prime importance in the interpretation of absorption data and further work is necessary before the factors governing these effects are fully understood.

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Number of Free Radicals in Coal During Carbonization at Different Heating Rates

During carbonization *in vacuo* at constant heating rates of 1 and 3deg. C./min. we measured the number of free radicals per gram of starting material of a vitrain with a carbon content of 86·9 per cent. This was done by means of an electron spin resonance spectrometer working at 9,000 Mc./s. The results are given in Fig. 1.

It can be seen that, when the lower heating rate is applied, the maximum increase in the number of free radicals is reached at a lower temperature than