15. Surface Diffusion of Mercury on Tin Foils

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In this studies we used two groups of tin foils reduced from 2 mm to 7μ in thickness. One group A was treated with benzol and ether, the other group B benzol, slightly etched by HCl dil., and subsequently washed in the order of water, alcohol and ether. As more chan 2 days passed between rolling and surface treatment, X-aay Laue photograph of tin foil showed that both samples had already been recrystallised.

Tin foil was down on mercury kept in a dish, and measurements were held in electric thermostatt. From Fick's differential equation of diffusion, using proper boundary conditions of surface diffusion, we obtain $D=y^2/t$, D is surface diffusion constant, y diffusion distance and t time.

We can easily discriminate between diffufed surface and original tin surface. Diffusion constants are as follows:

C°	$D_A\times10^{-4}$	$D_B\times10^{-4}$	°C	$D_A\times10^{-4}$	$D_B\times10^{-4}$
12	2.93	1.31	72	8.52	6.20
25	3.89	1.81	95	11.60	10.20
46	6.34	3.49		(cm²/sec)	(cm²/sec)

Thus we obtain $D_A=0.1516\ \exp(-354°/RT)$, $D_B=-1.148\ \exp\ (-5180/RT)$, Many studies tell that in the case of electrolysis of binary alloys, one component of alloy is enriched to one electrode and the other to opposite side. We applied direct current to surface diffusion by hanging down two tin foils on one dish filled with mercury and made a circuit with battery. In this case, we found that movement of mercury atoms, i. e. acceleration or retardation of diffusion velocity at electrode, can be easily determined in a short time in comparison with ordinary electrolysis. At 12°C, under the condition of 6V–6A, and 6V–2A, diffusion velocity of mercury were accelarated at anode.

But the diffusion velocity at each electrodes is larger than in the case of no current, because of temperature elevation due to Joule's heat.

X-ray photograph by back reflection of diffused surface shows the rings of planes (103), (300) and (003) in hexagonal system (Hg 6–10 %).

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16. Orientation of Products on Rolled Metal Surface

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The study of surface reaction products offers an intersting problem in connection

Although on the orientation of reaction propucts on the surface of single crystal has already been published, none has yet been reported on the case of metals which have fibre structure. We therefors studied on some compounds produced on the surface of copper and silver foils, prepared in the following way. Copper foils with are reduced to from 2.5 mm to 27–30μ in thickness, have a fibre structure, whose axis [111] is in parallel with the direction of rolling. Silver foils, reduced to from 1 mm to 30μ in thickness, have also a fibre structure, whose axis [112] is in parallel with direction of rolling.

CuJ: To produce CuJ on copper foil, we put it on J_2 in test tube, to avoid the sublimation of J_2, and heat at 70°C about one hour, and then we obtain CuJ film which peels off easily from ground copper foil. To this ground foil, Laue photograph is identical with that of the original foil; film shows continuous Debye ring (111) and suggests no special orientation.

CuCl: In putting the sample foil in test tube with PCl_5, we can obtain yellow CuCl film, and Laue photograph of it shows incomplete and discontinuous rings, suggesting somewhat oriented structure, but not enough to determine the direction indices.

AgCl: As silver reacts with PCl_5 and Cl_2 very slowly, we dipped silver foil in mixed solution of NaCl and $FeCl_3$. AgCl film thus obtained, showed the uniform Debye rings of (111), (200) and (222) of AgCl, suggesting irregular orentation.

CuS: CuS is obtained as black film when heated with sulphur at 100°C 30 minutes. From tne fact that this film is soluble ih hot HNO_3 dil., but insoluble in H_2SO_4 dil., we can deduce that this may be CuS. As has been expected, Laue photograph shows continuous (100) Debye ring, suggesting no special orientation.

Cu_2S: By painting molten sulphus on copper foil, we can get rather black film. As this film is soluble in warm HNO_3 dil., we can expect this may be Cu_2S and its Laue photograph shows the Laue spots of planes (111), (200) and [112] axis of fibre structure.

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17. Studies on the Biological Assay of Insecticides. (XI)

On the Discrepancy of Knock Down Effect of DDT Powder Prepared with Volclay Bentonite and Panther Creek Bentonite to the Adult of Common Housefly (*Musca domestca* L.)

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Volclay is known as "sodium bentonite" and Wyoming–South Dakota region is the largest place of production; Panther Creek is "calcium bentonite" and is pro-