above consideration can be applied only when $k$ is sufficiently large.

Hitherto we have only two reports on experiment on this subject. In the experiment of A.M. da Silva$^6$, the $\gamma$-ray used had the energy of 2.65 MeV or about $5.2\text{mc}^2$, which is only a little above the critical value $4\text{mc}^2$. So our consideration cannot be applied to this case. The data shows that three electrons have energies of the same order. In the experiment of K. Shinobara and M. Hatoyama$^7$, in which the photon energy is about $12\text{mc}^2$, four cases of small recoil and one case of large recoil have been obtained. This seems to support the view that small recoil processes are more frequent.

If this view is accepted, it is easy to account for the fact that our process has been so difficult to observe notwithstanding that the cross section does not seem to be extremely small. Indeed if many are small recoil processes, the “recoil” electron would be absorbed by the matter without being detected and the process would not be distinguishable from the usual pair creation due to nuclei. It would be only in a gas, as is in the experiment of Shinobara and Hatoyama, that we can expect to detect electron of such a small recoil energy.


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$^6$ Ann. de Physique 11 (1930), 504.
$^7$ Phys. Rev. 59 (1941), 461, also due to private communication from Mr. Hatoyama.

Electron-diffraction Pattern due to Molten Tin Surface.

By Yoshihiro SAYAMA.

The surfaces of molten metals were investigated by means of electron-diffraction by Jenkins in 1935. His investigation was however, concerned with the structure of the oxide films formed on the surface and not of the molten metal proper. In the present experiment a diffraction pattern due to the surface of molten tin metal was obtained.

A single crystal of tin, in the form of a thin film, was prepared by condensing in vacuum the vapour of the metal onto a cleavage face of molybdenum (MoS$_2$) heated at about 100°C. The surface of the film showed an interference colour of yellow or red and produced sharp net patterns as reproduced in Fig. 1. The analysis of these showed that the tetragonal tin crystals are orientated in such a manner that (100)$_1$(001)$_0$ and $\langle 100\rangle$.(001)$_{1/2}$. (100)$_{1/2}$.

The specimen was heated slowly in the crystal chamber of the electron-diffraction camera, observing the pattern on a fluorescent screen. When the temperature was raised over 100°C, the spots became gradually diffuse and less intense; and at 220°C–250°C they disappeared suddenly and there were observed only two diffuse

3. No change was observed at 161°C.
rings which passed the position of the (200) or (400) spots. The temperature was raised slowly; no sudden change was observed at 220°C and the rings continued to be observable even at lower temperatures. At about 80°C the (200) and (400) spots began to appear on the rings as reproduced in Fig. 2; the spots increased in their intensity when the specimen was at room temperature and several hours later the sharp spots as observed in Fig. 1 were again observed.

In the course of this procedure, no pattern due to any oxides or contaminations was observed. Therefore the two rings observed at high temperatures were produced by the molten tin metal. The rings at lower temperatures may be due to small crystals orientated at random or to supercooled liquid. Be as it may, the atomic arrangement in the molten metal near the surface is very similar to that of the solid.

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