

## On the Dialysis of Platinum-carbonyl Sol.

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It was described, in the preceding paper<sup>(1)</sup>, that the platinum-carbonyl sol obtainable at ordinary temperature from a dilute aqueous solution of chloroplatinic acid by the action of carbon monoxide would, if left alone in the air for some time or submitted to dialysis, turn black from red colour to yield a platinum sol. This could be interpreted to be caused by the disappearance of carbon monoxide from colloidal particles owing to its volatilization towards as well as oxidation by the air during these processes. In fact, the red sol is so stable, if kept in touch with carbon monoxide, that it would be tinged, as it is, with red slightly inclining to purple for a long period. For instance, a platinum-carbonyl sol prepared from a 0.05% solution of the acid and hermetically sealed with the gas in a test-tube was scarcely charged with any appreciable change in colour for more than two years, though colloidal particles in the sol would come to display sedimentation in due course of time. The aspect of the red sol at several months after its preparation is illustrated in Fig. 1. Although the sol settled almost wholly about two years later, it could disperse with facility, if exposed to the action of supersonics, to be the same in appearance as ever.

It may be presumed from these facts that, if dialyzed in the atmosphere of carbon monoxide, platinum-carbonyl sol will be set free, assuming red as it is, from hydrochloric acid liberated, in process of preparation, from chloroplatinic acid in consequence of its reduction by carbon monoxide. This was verified to be the actual case by the present experiment.

**Experimental.** The apparatus used is schematically shown in Fig. 2. Shortly after its formation, the red sol is transferred quickly and smoothly into the dialyzer, and immediately, subjected to dialysis, passing continually carbon monoxide through the sol as well as the dialyzate in turn. The dialysis was conducted with frequent changes of the dialyzate until freed from chlorine ions for a long space of time extending over fifteen days at room temperature, making use of a sheet of viscose in tubular form as the dialyzing membrane (M). Whenever the dialyzate was taken out through the cock (C) to be tested of chlorine ion, it was immediately supplied through the tube (T) from the reservoir (R) provided with a compression-valve (V). The conclusive test of chlorine ion was made directly with the sol in such a manner that a small portion of it was pipetted out from the dialyzer, converted by heating to a black sol of platinum, separated from suspending particles by dint of centrifuge, and now, submitted to the trial on chlorine ion.

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(1) I. SANO, this Bulletin, 9 (1934), 320.

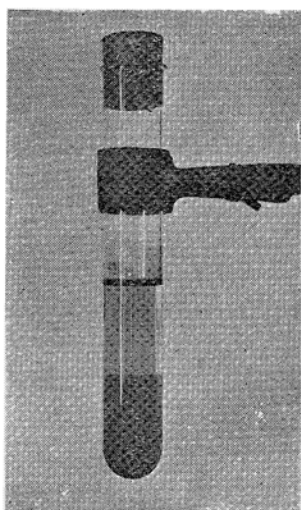


Fig. 1.

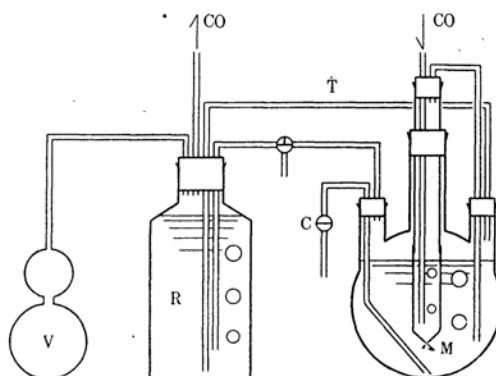


Fig. 2.

The experiments were made with the sols prepared at ordinary temperature in the same way as previously from 0.02 as well as 0.05% solutions of chloroplatinic acid. The sols obtained through the process of dialysis are the very same as they were before, not only in appearance but also in behaviour. For example, they assume a red colour which is slightly tinged with purple, decompose readily with the addition of bromine water or turn black, if left in the air or heated to some extent, to produce platinum sols. According to electrophoretic investigation, they are negatively-charged sols as ever.

It may be concluded from the results that the particles in the red sol, dialyzed or not, are composed only of platinum and carbon monoxide. The possibility of compounds containing chlorine as an essential constituent such as discussed in the preceding paper<sup>(1)</sup> would be not worth consideration. The formation of colloidal platinum surrounded by molecules of platinum-carbonyl has already<sup>(1)</sup> been substantially denied from various facts.

#### Summary.

The platinum-carbonyl sols of red colour prepared from 0.02 as well as 0.05% aqueous solutions of chloroplatinic acid were dialyzed in the atmosphere of carbon monoxide, as they would turn black to convert into platinum sols when treated in the air, until freed from chlorine ions.

The sols obtained through the process were just the same in appearance as well as in behaviour as they were formerly. This implies that the particles in the red sols, dialyzed or not, are fundamentally constituted from platinum and carbon monoxide or platinum-carbonyl.

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