often occur without being accompanied by a corresponding morphological change. The change in diffraction pattern is usually observed earlier than the change in electronmicroscopic pattern. This means that the atomic rearrangement has occured without affecting the external shape and the specimen at first assumes a "Psesudo-structure" or the external change is beyond the resolving power of the electron-microscope.

5) Diffraction patterns of Mo and MoO_2 particle produced by reduction within minute single crystal of MoO_3 show some preferred orientation. Such an information can only be obtained by the micro-diffraction method.

---

11. A New Method for Measuring Surface Temperature

A Wide-range Self-recording Device

Nobuji SASAKI and Akira KAMADA

(Sasaki Laboratory)

The knowledge of surface temperature of living and inanimate objects has become increasingly important in science and industry. But the method of measurement seems not to have been well standardized (reference is made to two articles in the book, "Temperature, Its Measurement and Control in Science and Industry", American Institute of Physics, Reinhold Publishing Corporation, New York, 1941, 1) "Measurement of Surface Temperatures", F.C.Houghten and H. T. Olson, p. 855, 2) "Temperature of Incandescent Lamps", W. E. Forsythe and E. M. Watson, p. 1188).

The method presented here makes use of a thermocouple (in principle a resistance thermometer or even a liquid-in-glass thermometer can be used as well) whose measuring junction can be adjusted to any temperature. The temperature of the junction indicated by a millivoltmeter in the couple circuit is also the temperature of the surface, if the junction temperature has been so adjusted that the needle of the meter shows no deflection, when the junction makes a light brief contact with the surface (for a wet or liquid surface a non-wetting junction should be used).

Surface temperatures measured by this method can be recorded and the principle of the method thereby clearly visualized.

The alternating current for heating the measuring junction of a thermocouple is periodically and smoothly varied between two fixed values by moving slowly the iron core A to-and-fro in an inductor B in the circuit (Fig. 1). The temperature of the junction C oscillates between two temperatures T_1 and T_2. A galvanometer (period 0.2 sec, internal resistance 37.3 ohms, and the sensitivity 5×10^{-8} amp/mm.) D in the thermocouple circuit reflects a light spot from source S into a photographic film moving vertically. The record is a sort of sine curve which oscillates between

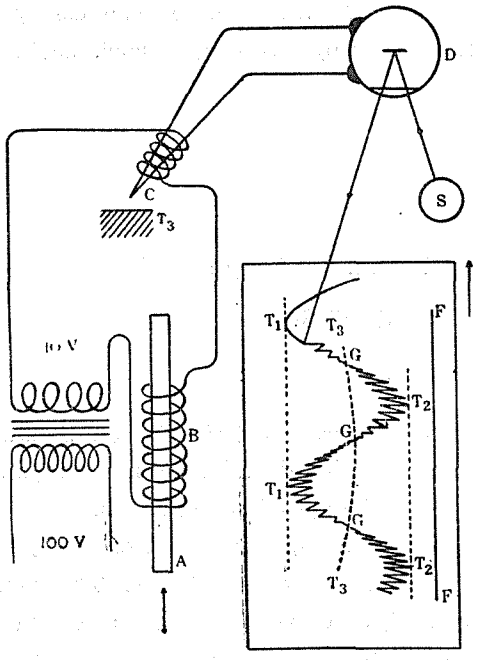

Fig. 1. Diagrammatic view of the recorder for determining surface temperature T_3.

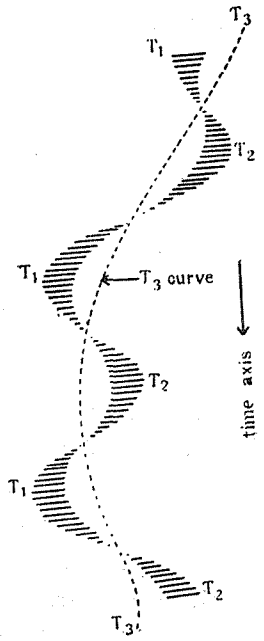

Fig. 2. Expected record of a widely varying surface temperature T_3.

T_1 and T_2 as it progresses in the direction of the time axis F. The temperature T_3 of the surface lies between T_1 and T_2. The measuring junction makes brief contacts with the surface at regular intervals. At each contact the light spot makes a small rapid deflection whose magnitude is maximum when the junction temperature is either T_1 or T_2 and diminishes as it approaches T_3 where the deflection vanishes. Thus there is one point of zero deflection G on each positive or negative loop of the serrated "sine" curve between the extremes T_1 and T_2. If we connect the points of zero deflection G, we get a surface temperature *vs* time curve (Fig. 2) for a point on the surface being measured. Strictly speaking, the zero deflection should be interpolated between two successive serrations of opposite deflection, for the contact does not always occur just when the junction is at T_3.

Practical inconvenience that arises in case the range of variation of surface temperature T_3 becomes much wider may be overcome by a device which will enable the measuring junction temperature automatically follow the surface temperature by oscillating about it in small amplitudes.

This can be accomplished by automatically changing the heating current for the measuring junction, from decreasing to increasing or *vice versa*, everytime when the serration attains a certain depth.

Several sorts of automatic devices have been tried with success. The latest one is to utilize a thermocouple type electronically self-balanced pen-and-ink temperature

recorder as manufactured by Shimazu Seisakusho Ltd., Kyoto. It can easilly be transformed into a surface temperature self recorder by attaching a simple device to it.

---

12. Qualitative Analysis by Anion Exchange Resin

Kazuyoshi TAKIYAMA and Eiji SUITO

(Suito Laboratory)

Ion exchange resin can be employed to prepare pure lyophobic sols or precipitates from solution. The authors applied anion exchange resins of various forms to separate cations into the groups of qualitative analysis by the precipitation method.

Amberlite IRA-400 or 410 was changed to chloride-, sulfide-, hydroxide-, and carbonate-ion exchangers and about 10 cc of them packed in columns. The sample solutions, whose concentrations were 0.01 to 0.1 N, were passed through these columns and washed by water of 10 times the volume of the original. The filtrate contained the precipitates corresponding to the form of exchangers. The precipitates were analysed as usual. The outline of this method is shown in Table 1.

The sample solution was passed through a chloride-ion exchanger. All of Ag ion was precipitated and Pb, Bi, Sb, and Sn ions were partially precipitated when they were present. Every anion contained in the original sample solution changed to chloride ion and the precipitates could be formed without interferences of anions.

The filtrate from these precipitates of Group I was passed through a sulfide-ion exchanger. All ions of Groups II and III except Al and Cr ions were precipitated as sulfides by this procedure. As these precipitates were very fine, Group III was readily dissolved in 0.3 N HCl. The acidic solution containing sulfides of Group II was heated to boil to coagulate the precipitates and to concentrate the solution. After filtration, the precipitates were separated into the two sub-groups as usual.

The sulfide-ion exchanger applied to this procedure was generated with yellow ammonium sulfide. It seemed that the resin adsorbed only sulfide ion, because all ions of Sn-Group were precipitated by the exchange.

The filtrate from Group II was passed through a hydroxide-ion exchanger. All of the ions of Group III were precipitated as hydroxides. When Mg ion was present, it also precipitated as $Mg(OH)_2$. Then this solution containing the precipitates were added ammonium chloride to dissolve $Mg(OH)_2$. The precipitates were filtered and these hydroxides could be analysed as usual without changing to sulfides, because all ions of Group III had been precipitated. Some of Al ion seems to be adsorbed in the resin.