CHIKASHIGE AND UNO-LABORATORIES.

Present director: Dr. Denzō Uno, Professor of Metallography in the Department of Science, Kyoto Imperial University.

At the time of the foundation of the Chemical Research Institute in April 1927, the Chikashige-Laboratory was established as one of its branches.

At the same time, several investigations were begun under the guidance of Professor Masumi Chikashige, dealing with the scientific and industrial sides of metallography. The brief sketch given below begins with an outline of these investigations.

One of the most celebrated applications of modern science to a historical consideration of ancient civilization was made in the Laboratory by Professor Chikashige, who successfully attempted for the first time to re-examine ancient alchemy in the Far-East from the chemical and metallographical point of view. The results of this examination were published in his monograph, "Oriental Alchemy (1929)" (in Japanese) and "Alchemy and other Chemical Achievements of the Ancient Orient (1936)". Furthermore, to continue this examination, he conducted chemical and metallographical researches the results of which were reported in "The Composition of the Han Mirrors and their Reproduction" [Proc. Imp. Academy, 5, 345 (1929)]. It was entirely due to the results of these researches that this Laboratory succeeded in reproducing some superior ancient Chinese mirrors. His investigation was also extended to various metallic wares formerly manufactured in Japan, but the results have not yet been published.

The contributions of Professor Chikashige, who was the first to notice the metallographical importance of the relation between the colour and microstructure of alloys, to the progress of the investigation during the earlier days of the Chemical Research Institute, were not restricted to the inquiry of ancient matters. A number of experiments in various fields of metallography were also made by Professor Chikashige and his co-workers.

It is to be noticed that the results of these researches enabled us to form a brass layer on the surface of copper or its alloys by the diffusion of vaporized zinc, on the one hand; while, on the other, they led to the discovery of a non-oxidizable silver alloy excellent for coinage, as can be seen in the publications "A New Coinage Metal; Forgery detectable without Analysis" [M. Chikashige and S. Ueno; World Eng. Cong., Tokyo (1929)] and "Ternary Alloys of Silver, Zinc and Copper" [M. Chikashige and S. Ueno; Japanese Patent, No. 82259].

Not only those above mentioned, but the crystalline configuration of a so-called single crystal in some metals obtained by sublimation, together with the crystal structure of intermetallic compounds, were also examined with X-rays. The results of these X-ray examinations were published in the papers "On the Arrangements of the Micro-Crystals in Zinc and Cadmium obtained by Sublimation" [T. Yamamoto; Mem. Coll. Sci., Kyoto Imp. Univ., A, 11, 34 (1928)] and "On the Crystal Structures of the Compounds formed in Sb-Cd Alloy" [M. Chikashige and T. Yamamoto; Anniversary Vol. dedicated to M.
Chikashige 195 (1930).

In September 1930, Professor M. Chikashige, who celebrated his sixtieth birthday, retired because of his seniority, and his pupil, Professor Denzō Uno, was appointed as his successor. At the same time the Chikashige-Laboratory ceased and in its place the Uno-Laboratory was established.

By introducing the dilatometric study, Professor D. Uno endeavoured with his co-workers to continue the investigations which had been begun by Professor M. Chikashige. So, the researches carried on in the Uno-Laboratory naturally bore a close relationship to those made in the Chikashige-Laboratory.

The diffusion between the structural elements of various alloys in the region of the solid solution, were examined in the newly established Laboratory. Especially with regard to copper-rich alloys, a precise argument was advanced as to the solid solubility of some metals in copper. The results of these researches were reported in “Investigation of the Solid Solubility of Alloys, I.” [D. Uno, S. Yoshida and S. Katori; Rep. Chem. Res. Inst., Kyoto Imp. Univ., 3, 152 (1933).] (in Japanese), “The Dilatometric Study of cast Copper-rich Bronze” [D. Uno, S. Katori and S. Fujii; Bull, chem. Soc. Japan, 10, 397 (1935).] (in German), “On the Abnormal Phenomena in heating cast Copper-rich Sb-Cu Alloys” [Tanaka and M. Iio; Bull. chem. Soc. Japan, 56, 1293 (1935).].


Furthermore, the X-ray investigation carried on in this Laboratory,
was extended to the study of silumin structure, the results of which were published in “On Silumin-Structure” [H. Kotô; Rep. Chem. Res. Inst., Kyoto Imp. Univ., 5, 104 (1935)] (in Japanese) and “On the Crystal Structure and Crystalline Configuration of the Normal and Modified Si-Al Alloys” [H. Kotô; Mem. Coll. Sci., Kyoto Imp. Univ., A, 18, 17 (1935)]. These papers revised the theory of modification of silumin-structure arrived at up to that time.

Now, Professor D. Uno and co-workers endeavoured to bring purely scientific theory and its industrial and technological applications into a more intimate relationship. Their achievements in mentallographical investigation were naturally not restricted to those above stated. They succeeded in manufacturing various silver-wares, by finding some silver alloys which could be highly hardened by simple heat treatments. The procedure for obtaining these silver alloys was reported in the publications “Abnormal Phenomena in Heating some Silver-rich Al-Ag Alloys” [D. Uno and S. Yoshida; J. Chem. Ind., 36, 503 (1933)] (in Japanese), “Temper-Hardened Silver Alloys” [D. Uno and S. Yoshida; Japanese Pat., No. 104732]. New methods for plating the beautiful alloys used in ancient Japan, such as Shakudo (the dark-blue or deep violet gold alloy) and Shibuichi (the olive-greenish or fine grayish silver alloy), on the surface of copper and its alloys by diffusion were also invented. These inventions were reported in “New Methods in Producing Shakudo and Shibuichi” [D. Uno and K. Tamura; Rep. Chem. Res. Inst., Kyoto Imp. Univ., 5, 119 (1935)] (in Japanese), “The Colouring Methods for Shakudo plated upon Copper or its Alloys” [D. Uno and K. Tamura; Japanese Pat., No. 106714] and “The Colouring Methods for Shibuichi plated upon Copper or its Alloys” [D. Uno and K. Tamura; Japanese Pat., No. 106715], and they enabled the Laboratory in producing various metallic wares of ever-bright and beautiful outview, as were made of genuine noble Shakudo or Shibuichi.