Research and Application of Diethyl Ether Solution of Au(III)

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In "Seimikaiso", the first Japanese systematic chemistry book published in 1847, the author wrote that " When we mix diethyl ether with the Au solution (which means Au(III) solution), Au is dissolved in diethyl ether. ". We tried to reproduce the experiment, and found that amount of [AuCl4]- in aqua regia removed into the diethyl ether layer was greatly related to pH of the water solution. Using aqueous solutions of H[AuCl4] we succeeded to evaluate the distribution coefficient D in the ether solution versus water solution at each pH. The exponential tendency was obtained. When metallic zinc was put into the Au(III) ether solution, zinc was plated and became red. This means non electrolytic gold plating is possible using the ether solution of Au(III). Furthermore zinc was plated to become golden color in the concentrated Au(III) ether solution. Thus the gold plating is controlled by the concentration of Au(III) in diethyl ether. "Shakudo" is the copper alloy containing 3-5% of Au. By attaching an oxidation film to the surface of copper using chemical such as the verdigris artificially, it becomes deep black tinged with the bluish violet. It is used for Japanese art objects such as the sword guard or "Zogan-zaiku" as a high-quality article. We succeeded in making the hue that was similar to "Shakudo" when we used the gold plating method mentioned above for copper. The gilding method using diethyl ether solution may create plating with completely new color by applying it to silver or platinum surface.

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