Color Change of Copper Foil by Oxide Thin Layer Formation

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It is known that copper plates are heated in the air to form copper(I) oxide on their surfaces and give various colors due to optical interference of thin film. Heating copper foil was found to give much clearer and more various color change. Colors obtained are orange, purple silver, gold, pink, green depending on the temperature and time applied. A muffle furnace was used for heating. Temperatures applied were between 160 °C and 250 °C with 10 °C intervals. Lengths of the heating time were 10, 20 and 30 min. Regularity in color change was observed depending on the temperature and time of heating. This regularity of color change was estimated due to the diffusion length of oxygen atoms in metal. It can be calculated from the diffusion coefficient and the activation energy obtained from a reference. Its calculation using the diffusion coefficient and the activation energy from a reference makes it possible to estimate the color obtained at any condition. Gold foil and silver foil have been important for Japanese traditional arts such as paintings, folding screens, lacquer wares, and other decoration materials. Blue, red, and black silver foil obtained by the reaction with hydrogen sulfide is also useful for such purpose. The copper foil obtained here will be promising as a new materials used in art.

Awards Won:
Third Award of $1,000