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Phase Transformation and Mechanical Properties of 14 K White Gold Alloys by Heat Treatments

윤돈규, 서진교, 안용길, 신소라, 한동석, 박종완*

한양대학교 신소재공학과

Because of beautiful glossy and color, the value of gold leverage is very high in Europe. To improve the quality of gold alloys, we performed heat treatment on 14 K white gold alloys by variously changing age-hardening conditions. Age-hardening behavior and the related phase transformation changes were studied to elucidate the hardening mechanism of 14 K white gold alloy. For solid solution treatment [ST], casted gold alloy specimens were treated at high temperature (750^{o}C) for 30 minutes, and the specimens dropped to water to quench them. For Age-hardening treatment [AT], the specimens were treated at various temperatures (250～300^{o}C). After the heat treatment, we observed the phenomenon to increase hardness from 126 Hv to 166 Hv by Vicker's hardness tester. Through electron probe micro-analysis (EPMA) mapping analysis, we investigated that irregular particles were changed uniformly. In the SEM and OM images, two phases of matrix and particle-likestructures were observed, and the precipitation of these elements from the matrix progressed during age-hardening. By transmission electron microscope and X-ray diffraction observation, it was revealed that the formation of the Au3Cu superstructure contributed to the age-hardening at 270^{o}C in the gold alloy. After the heat treatment, this analysis shows that casted gold alloys were to improve hardness and to moderate surface defects at specific temperatures and duration.

Keywords: Age-hardening, Solid solution treatment, Hardness, Grain size