

Research on the Corrosion Mechanism of Bronze Metal Chaplets in Ancient Chinese Bronze

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Abstract: Metal chaplets were frequently used in ancient Chinese bronzes. The use of chaplets has been regarded as technological progress for a long time; nonetheless, the research shows that there is a transition zone of oxidation between chaplets and metal body formed during the solidification of bronzes, which negatively impacts these bronzes. To date, the transition zone has attracted insignificant research attention. In this study, the scanning electron microscopy–energy-dispersive X-ray spectroscopy (SEM-EDS) analysis on elemental composition and metallographic investigation of the transition zone were carried out in a reconstructed bronze tripod. It was found that the transition zone mainly consisted of copper oxides. X-ray diffraction (XRD) analysis further reviewed that the basic composition of the zone was cuprous oxide, which was formed during the solidification process of the bronze vessel due to its high-temperature and low-oxygen environment. The existence of the transition zone possibly led to preferential corrosion during usage, and thus caused the shedding of chaplets and damage the integrity of bronzes. The existence of this inevitable transition zone indicates the occurrence of inherent defects in the metal chaplet technology. Although this technology can improve the casting success rate and is a progress in social production, it can also affect the integrity of bronze and is a compromise of the bronze casting technology itself.

Keywords: Bronzes, Metal Chaplets, Transition Zone, Cuprous Oxide

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