Ancient Iron Implements in Metallographical Observation

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This study is an integral part of the "Tradition and Succession of Conventional Techniques", a special study by the National Museum of Japanese History. First the sintered iron sand found at the ancient iron furnace excavated at Fujimidai vestige, Chiba Prefecture was studied in its reducing reaction process through a metallographical observation by a scanning electron microscope, using the iron-making related samples collected nationwide and analyzed, then the iron ore as raw material of iron implements was identified through analysis of the composition of the inclusions recognized in the iron implements unearthened at two historical vestiges: Shimo-Hontani, Hiroshima Prefecture and Taira, Okayama Prefecture. Then the study was conducted to clarify the relationship between the iron implements and iron slag through the component analysis of the slag unearthened from the same vestiges.

Our study this time performed allowed us to have the following findings:

1. An analysis of iron sand sample sintered in the iron-making furnace led to a clarification of the concentration process of titanium constituent into slag in the iron-making using iron sand and the mechanism of production of metallic iron in the ancient iron-making furnace. The result of this analysis of samples turned out to match well with the theory of thermodynamic phase equilibrium.

2. As a result of the analysis of the inclusions existing in the iron implements unearthened at the Shimo-Hontani vestige in Hiroshima Prefecture, it has turned out that the composition thereof is almost identical with that of the iron slag unearthened at the same vestige. This materially revealed the fact that an analysis of the inclusions in iron implements reveals the slag composition at ancient time and that by this we can deduct the iron-making techniques of the time.