A Chemical Study on Relic Related to Iron-Manufacturing in Sendai-Han (Fief)

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I have studied iron-manufacturing techniques in Sendai-han (a fief in the Edo period) with relic collected by field investigations at many iron-manufacturing sites distributed in Iwate and Miyagi prefectures. In this paper, results of chemical analysis are shown on iron sand (titanomagnetite), charcoal, and slag collected from the northern area of Sendai-han. The iron-manufacturing in this area is obviously characterized by using of high quality iron sand as material. According to historical documents, iron was manufactured in this area as a subsidiary industry in the farmers' slack seasons. From the field investigations I have confirmed that there were many small and non-intensive iron manufacturing sites there. Easily-reducible high-quality iron sand, which contains low concentration, about 2—4% of TiO₂ and very low impurities, might have enabled iron to be manufactured under such a relatively simple form of operation. Minerals which are considered to be produced under high-temperature and reductive conditions, such as ferropseudobrookite or ilmenite, were observed in the slag. It is supposed that furnaces, though small, were operated under a relatively high temperature. In the areas examined in this study, it is considered that the iron sand used as raw material was of similar chemical composition and iron was manufactured by similar methods. Therefore, no varieties were observed for relic from each iron-manufacturing site.

As seen above, some features of iron-manufacturing in Sendai-han were made clear with the chemical analysis of relic. In addition to the northern area, the investigation results of which are reported in this paper, chemical and historical investigations on iron-manufacturing sites in the central and southern areas of Sendai-han are now carried out.