Analysis of Iron Slag of Ancient Turkey and Syria by 
Scanning Electron Microscope

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Scientific examination of iron slags using various testing appliances sheds light on new facts and relevations on the iron-and steel-making areas concerned beyond what is obtained just by looking into data on the iron ores used and semi-processed products.

Examination tells if the site concerned was a place for smeltery, or that for processing works such as smithery or foundary. In the case of smeltery with iron ore, examination identifies if it was magnetite, hematite, limonite, iron core carbonate, or others. In the case of smeltery with sand iron, examination shows if it was acidic sand iron or alcalic sand iron.

Together with the layout of the site, data on the iron slag generated through processing makes it clear if the site was for forgery or smithery. Furthermore, the examination of compositions included in small amounts enables us to research the relationship between the forgery site and processing site.

The author visited various sites along the Silk Road in recent years, and was able to obtain a few samples for research through investigation of the sites from which iron slag was excavated. The samples were examined using a scanning electron microscope with X-ray microanalyzer at the National Museum of Japanese History. The results are shown in the present report, together with chemical analysis results and X-ray analysis data for reference.

The samples used in the investigation were as follows: (A) iron ore and iron slag discovered at the middleslope of Hoyuku, a site in Cappadocia Province, Republic of Turkey, extending from Hittite to Phrygian age, and (B) iron slag collected from the ground surface near the Basil Shamin Shrine in the Palmyra Site, Republic of Syria.

Samples (A) were limonite containing calcium, and smelted slag consisting of wustite and fayalite to which calcite seemed to be added when smelting the ore. Samples (B) were probably forged slag, judging from the place where they were collected. However, estimates based on electron microscopic data and chemical analysis results showed insufficient heat influence by the forging furnace. The samples were determined as forged slag containing much calcium.