Synopsis of the Thesis

Technical Studies in Chalcolithic Period
Copper Metallurgy

The problem of identification and correct interpretation of the metallic artifacts that are recovered from excavations of the archaeological sites in India, has not been thoroughly solved. In order to understand and assess their cultural level, one cannot afford to neglect the study of the advance or degeneration in the metallurgical field; therefore, a detailed metallurgical study of a number of stratified metal objects of a region and period, is essential. It can provide one with such important information as:

(1) The probable sources of the raw material from which the metal was extracted,

(2) A Comparative study of the composition of such contemporary objects of a region, can result in establishing groups of objects with relative agreement in the composition. Such agreement is usually derived from the use of similar sources of raw materials for extracting the metal. More often than not, the raw materials with similar composition belong to one region. Therefore, such a study can, not only provide with clues to the original sources of the raw materials but also
the distribution & pattern of the metal extracted from the raw materials of a particular region.

(3) If it is observed that, the metal extracted from the raw material of a region was distributed far and wide, that will demonstrate the direct or indirect contacts of the contemporary communities.

(4) The study, will also show the important features of the metallurgical techniques employed in the extraction of the metal.

(5) The determination of the percentage composition of the objects will bring to light the quality of the metal and whether the objects were made of comparatively pure metal or an alloy.

(6) The metallographic examination of the specimens will reveal the techniques employed for producing the objects from the solid metal.

(7) The metallographic examination can also bring to light the physical conditions of the metal, such as porosity, brittleness and non-metallic inclusions present in the metal.

These detailed informations are invaluable for determining the technical stage attained by the community to which the objects in question belonged.

The metallurgical study of archaeological objects,
therefore, not only provides one with the necessary information for their correct identification and precise interpretation, but also helps to complete the archaeological record of a people.

This thesis is based on the metallurgical study of the representative chalcolithic period copper objects recovered from excavations at Ahar, Navdatoli, Chandoli, Somnath and Langhnaj. It is aimed at elucidating the technical knowledge possessed by the Indian Copper metal working communities of the period.

With this aim in view, the following studies are included in this thesis:

(1) The detailed metallurgical study of the artifacts. This study consisted of (i) Spectroscopic analysis; (ii) Quantitative chemical analysis and (iii) Metallographic examination of the objects.

(2) Spectroscopic and Quantitative chemical analysis of the sample of Chalcopyrite copper ore obtained from the ancient copper ore mine of Khetri, situated in the Aravalli region.

(3) Quantitative chemical analysis of the samples of the slag like material recovered from the Period I levels at Ahar.

From these studies it has been possible to point out
(1) the correct identification and interpretation of the artifacts studied and (2) the important features of the Chalcolithic period copper metallurgy.

A Quantitative chemical analysis and spectroscopic analysis of a copper axe recovered from excavation at Tekkalakota, Bellary District, Mysore State, is included as an appendix to this thesis, which is divided into the following six chapters:

Chapter I
Introduction: definition of the Chalcolithic culture based on technology; evolution of the Chalcolithic culture; an outline of the Chalcolithic culture of India; copper artifacts of the culture; the Chalcolithic sites and the representative copper objects included in this study; the necessity of metallurgical study of Indian Chalcolithic period copper objects, previous work, methods employed in this study and a short summary of the results obtained.

Chapter II
Sources of raw-materials for smelting copper during the Chalcolithic Period.

Chapter III
Techniques employed in smelting copper during the Chalcolithic Period.
Chapter IV

Percentage composition and Quality of the Metal of the Chalcolithic Period copper artifacts.

Chapter V

Techniques employed in the production of artifacts from the Solid Metal.

Chapter VI

Epilogue.

Appendix

Spectroscopic and Quantitative chemical analysis of the copper axe recovered from the excavation at Tekkalakota, Bellary District, Mysore State.