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XRF ANALYSIS OF RIBBED DAGGERS FROM THE M.B.II 'WARRIOR' TOMBS IN THE CEMETERY OF RISHON LE-ZION, ISRAEL

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Daggers decorated mostly with 5 and sometime with 3 ribs along their blade (also referred to as rilled daggers, i.e. Philip G. 1989: 115-118, type 12-13; Ziffer I. 1990: 72*-73*) are well known in Middle Bronze Age II burials of Canaanite Warriors all over Israel and the adjacent regions of the southern Levant. Metallurgical analyses of 11 ribbed daggers from different M.B.II tombs in Israel (Ein Kinya, Aphek, Ajjul, Megiddo, Lachish, Rehov) and Egypt (Tell El-Dab'a) show that they were made of tin bronze, sometime with arsenic and sometime with lead as well.

In this paper we intend to present the results of new XRF analysis of 31 ribbed daggers all from one M.B.II cemetery in Rishon Le-Zion, near Tel Aviv, Israel. This metallurgical study gives us an opportunity to study a large group of objects (more then were previously analyzed) from a single archaeological location. In this MBII cemetery, we identified two major alloying modes, one of Cu+Sn (13 objects), another of Cu+As (5 objects) and a third group of mixed composition (14 objects) was identified. Identical objects are made from different alloys and even the less common type of three ribbed daggers are made of tin bronze and arsenical copper as well. Lead is used as additional alloy in some of the tin bronzes and some of the arsenical coppers and in most of the mixed ones.

Scanning the daggers show, in several cases, that the relative amount of lead and tin is significantly higher in the midrib area and lower towards the blade edge and tip. One dagger made of arsenical copper with lead show a significant difference metal composition bellow the original surface (2.2%As and 0.6%Pb) and on the surface remains (8%As and 10%Pb). These results emphasized the importance of conservation to be performed with a close contact with archaeometallurgical analysis and vice versa. In one of the analyzed daggers we sow, for example, that cleaning chemically the corroded surface layer reduces the amount of As and Pb to less then half the amount measured on the original surface.