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Establishing a Sourcing Database for pXRF, XRD, ICP-MS and Petrographic Analyses of Failaka Island (Kuwait) Ceramics in the Bronze Age

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Ceramics from Kuwait were analyzed to fingerprint production centers, possible raw material sources, as well as trade and exchange routes in the Bronze Age in the first scientific study of this type carried out in the Persian/Arabian Gulf. The samples analyzed for this first such scientific and preliminary study are a total number of 8 that were collected from the archaeological sites of Al-Khidr in Kuwait (also known as "The Port") and dated by conventional means back to the early second millennium [1].

Ceramic artifacts can typically be regarded as a two-component system consisting of matrix and clasts, which can ultimately be utilized for identifying raw materials (e.g. clays and tempering materials), as well as to document peculiarities specific to each production center, and trade and exchange routes. The ceramics used for this study were analyzed by means of petrographic thin section, non-destructive portable X-ray fluorescence, as well as high precision powder X-ray diffractometry. Exploratory trace elements determined by means of inductively-coupled plasma mass spectrometry (ICP-MS) were employed to inspect the quantitative accuracy and precision of the X-ray fluorescence technique.

The presence of abundant tempering material lithoclasts with a chemical and petrological composition corresponding to intermediate-acidic (meta)igneous rocks (e.g. granitoids) in some samples, the variable carbonate content, as well as the overall texture (e.g. preferential orientation of clasts, roundness, pore density and size, etc.) are excellent indicators for diverse raw source materials and techniques of manufacturing. Mineralogical (i.e. presence of the mineral gehlenite in some samples) and textural changes observed throughout the samples, especially in the composition of the matrix, argue for relatively high firing temperatures [2] and oxidizing environments.

Our preliminary data suggests that both petrographic and geochemical data can be successfully implemented to outline distinctive features of ceramic typology and as a basis for future analogies.

[1] Benedikova, Lucia, & Barta, Peter (2007). Kuwaiti-Slovak Archaeological Mission Excavations on Failaka Island. Bulletin of the Society for Arabian Studies, 12, 23-25.

[2] Cultrone, G., Rodriguez-Navarro, C., Sebastian, E., Cazalla, O., & De La Torre, M. J. (2001). Carbonate and silicate phase reactions during ceramic firing. European Journal of Mineralogy, 13, 621-634.