Study of salt fog phenomenon on the surface of excavated pottery sherds

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The phenomenon of salt fog on pottery surfaces attracted our team to study it and explain the reason for its formation. The crystallization of salts during drying leads to pottery damage. A significant step is to examine the types of salt and identify the chemical composition of the sherds. For this visual assessment, a digital microscope and a scanning electron microscope with energy dispersive X-ray analyses unit (SEM-EDX) were used to detect surface deterioration. In addition, X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) analyses were carried out to determine the chemical composition of potsherds and salts. The microscopic examination revealed a dense distribution of salts on the potsherd surface. Besides, the SEM photomicrographs showed clear cubic salt crystals of sodium chloride, especially after drying. The SEM-EDX analysis also revealed high chloride salt concentration, in addition to silica and aluminum oxide, which are the primary ingredients in pottery-making. According to XRD analysis, the pottery samples primarily contained diopside, hematite, magnetite, albite and muscovite, which are the primary components in manufacturing. Furthermore, halite appeared in large proportions due to the influence of burial soil. Besides, the quartz, clay minerals, hematite and calcite content of the samples were confirmed by FTIR. The results thus support the fact that sodium chloride significantly influences archaeological pottery.

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the pottery industry. Moreover, the pottery of this period was well made[4].

Water indirectly affects artefacts like pottery by transporting soluble salts, one of the primary causes of artefact deterioration[5]. As water penetrates the pores, the pottery deteriorates due to salts, particularly soluble salts[6]. The most common cause of salt attack is increased moisture in the soil[7]. Therefore, water penetration into archaeological objects is considered the primary cause of degradation, especially in porous materials[8]. When salt is dissolved in water, it can be transferred through a porous substance. During surface drying, crystallizing and accumulating salt is transferred to the evaporation destination[9]. Temperature plays a significant role in the crystallization of soluble salts. Salts crystallize more rapidly at higher temperatures, whether inside the body or on an external surface[10].

Salt crystallization in porous materials is a common cause of damage to archaeological objects[9]. Porosity has a vital role in the deterioration of archaeological pottery because the pore network permits penetration of water, which is accountable for the various chemical and physical damages in the pottery body[11]. Salt significantly affects the durability of archaeological pottery. Therefore, it is critical to comprehend the crystallization process inside the pottery body. This will help formulate a strategy to prevent or limit harm to porous materials[12].

Soluble salts severely decrease the durability of porous materials. Consequently, preventing salt crystallization requires understanding the mechanisms that cause the same[13]. The penetration of salt solution into the interior pores of pottery generates fissures, while the crystallization