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STUDY ON THE USE OF $\text{NH}_3/\text{NH}_4^+$ BUFFER SOLUTIONS FOR THE DECHLORINATION OF ARCHAEOLOGICAL IRON: A MORE ENVIRONMENTALLY FRIENDLY METHOD

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Abstract

This study investigates the possibility of using $\text{NH}_3/\text{NH}_4^+$ buffer solutions for the dechlorination (desalination) of terrestrial and marine archaeological iron. The approach uses ammonia-based chemistry to promote the transfer of chloride-containing species from corrosion products into the treatment solution, where ammonium chloride may form. This case study represents the second part of a larger work. The first part evaluated, by pH-metric measurements, the effect of $\text{NH}_3/\text{NH}_4^+$ buffer solutions on NaCl, KCl, FeCl_3 , Mohr salt, synthetic akaganeite, seawater and other substances. The added chlorides simulated those found in extracted samples, such as archaeological iron. In the present study, a series of experiments were developed, in which the dechlorination effect of $\text{NH}_3/\text{NH}_4^+$ buffer solution is tested on terrestrial archaeological objects, which usually have a low chloride content. Items with higher chloride content, such as marine ones, are also tested. During dechlorination, ammonium chloride is formed, indicated by the presence of NH_4^+ ions, which immediately affects the pH of the $\text{NH}_3/\text{NH}_4^+$ buffer solution. Real-time monitoring by pH-metry has proven to be extremely effective, as the generation of new ammonium ions during the chloride conversion process created distinct, quantifiable changes in the pH of the solution.

Key words dechlorination of archaeological iron, $\text{NH}_3/\text{NH}_4^+$ buffer solutions, pH-metry

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