

## Stabilizing corrosion product of iron and its alloys using tannic acid solution

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Tannic acid solution is used to stabilize rust on objects originally made of iron and its alloys. However the technique was not developed for objects of cultural heritage and is rather an extrapolation from industrial corrosion protection. In the situation of industrial corrosion protection the object of interest is either not corroded at all where corrosion protection serves as a prevention or to block further corrosion on the surface but the affected area is of a thin layer. On close examination industrial corrosion protection uses tannic acid to stabilize the surface. Voluminous layered structure of corrosion product which is characteristic for the long term corrosion is not present.

On the contrary in case of corrosion occurring on objects of cultural heritage corrosion product consists of voluminous layered structure. Even though the upper layers formed of amorphous rust and hematite could be easily removed by mechanical means overall corrosion product structure is compact and adherent to the metal core. In some cases the objects itself does not present the metal core and is formed by corrosion product only. Cross section of those objects does show characteristic layered structure.

In this work tannic acid solution without phosphoric acid addition was primarily used. The usage of phosphoric acid would be used to lower the pH of the tannic acid solution when it will be out of the 2.2-2.4 working interval. Using such approach the necessity of phosphoric acid addition to the rust converter could be approved. In addition the maximum conversion depth using tannic acid solution was studied.

Phase analysis consists of combination of following methods: X-ray diffraction to obtain phase composition of whole sample, ATR-FTIR and Raman spectroscopy were used to determine the maximum conversion depth of the solution. According to the results obtained the process of rust transformation did occur but the usage of rust converters based on tannic acid has its limitations and might be highly questionable for corrosion product as is present on objects of cultural heritage

In addition to the application comparable to situation used to prevent further corrosion of objects of cultural heritage – voluminous corrosion product layers. Laboratory simulation using tannic acid solution in excess with fine powder of lepidocrocite was used. Aim of this was to study the reaction kinetics. The lepidocrocite used were synthesized using the Schwertmann-Cornell book > Iron oxides in the Laboratory.