

OXIDATION-CORROSION (OF IRON GALL INKS)

Sample

Edict of Jaime Miguel de Guzmán. University of Barcelona. Spain. Laid paper, 100% rags.

Pathology Causes

The iron gall ink corrosion is due to the acid composition and chemical instability of its main components: gallnuts extract (tannin) and vitriol (iron (II) sulphate).

The natural oxidation of the gall ink produces the decomposition of the molecule and the formation of ferric sulphate. The hydrolysis of ferric sulphate produces acid sulphuric and ferric oxide. Ferric oxide cause the colour change and discoloration of the gall ink and acts as transport and catalyst for hydroxyl radicals (Fenton mechanism), oxidizing the cellulose and producing carbonyl and carboxyl groups. Sulphuric acid, migrating by capillarity, starts to oxidize the cellulose, causing the colour change of the paper. The acid compound also favours the hydrolytic splitting of the cellulose, producing the transformation of cellulose into sugar and therefore, the loss of support in the ink areas.

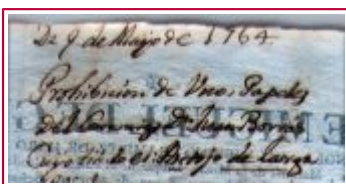
Visual Image



Author: Diana C. Mas Domínguez

Description: Handwriting with iron gall ink. Located on the reverse of the document, at the top centre.

Image detail / macro



Author: Diana C. Mas Domínguez

Magnification: Scale

Description: Visible change of ink color, especially at the edges of the stroke, although its opacity is increasing. Visible discoloration of paper areas besides and underneath the ink.

Figure 1. Visible change of ink color, especially at the edges of the stroke, although its opacity is increasing. Visible discoloration of paper areas besides and underneath the ink.

Figure 2. The ink has stroked-through the support, being visible on the obverse of the document.

Associated Pathologies

Acidity.
Discoloration.
Halo.
Oxidation.

Observations

The reactions between ink and support materials are strongly influenced by environmental and storage conditions, especially temperature and humidity. Also influence the dimensioning and the inorganic fillers and coating used in papermaking.

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Subject: Examen, Diagnóstico y Documentación II.

Bibliography

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